Products Liability, Corporate Structure, and Bankruptcy: Toxic Substances and the Remote Risk Relationship

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PRODUCTS LIABILITY, CORPORATE STRUCTURE, AND BANKRUPTCY: TOXIC SUBSTANCES AND THE REMOTE RISK RELATIONSHIP

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THIS paper addresses the interaction of three seemingly unrelated legal issues. Each is important in its own right; their interaction poses a problem of overwhelming magnitude for our legal system. The three issues are: (1) In products liability law, should firms be made to bear risks that are difficult to foresee? If no one knew that widgets cause scrofula, but they do, should widget manufacturers be liable to scrofula victims? (2) In corporate law, to what extent should limited liability isolate firm owners from products liability victims? Can company X create a subsidiary to produce dangerous products and escape liability for the resultant injuries? (3) In bankruptcy law, at least since 1979, can persons exposed to dangerous substances assert claims in the manufacturer's bankruptcy if their injuries had not materialized by then? If Smith purchases a drug made by company X in 1980, company X files a bankruptcy petition in 1981, and the drug sometimes causes injury to users years after ingestion, may a so far healthy Smith assert a claim in X's bankruptcy?[1]

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[1] The issue is new because under the old Bankruptcy Act one could not be a tort creditor until one had been injured. The definition of a provable claim has been expanded sufficiently

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These three issues recently have attracted attention because of their close linkage to "toxic risks." Toxic risks have four salient characteristics: (i) The substances that create them are neither defectively made nor designed, but cause harm because of their chemical nature: they cannot do good without also doing bad. (ii) The harms often materialize years or decades after persons are initially exposed. (iii) The existence and extent of the harms are difficult to predict; some substances turn out to be toxic while others do not. (iv) The harms measured in dollars can be large in relation to the value of the firms that sell toxic substances, because many people are vulnerable to them.[2]

The three legal issues are related to each other in the toxic risk context because of an obvious but overlooked fact: risks that are fully anticipated or minor seldom cause concern to firms or to the law. Toxic risks are hard to anticipate and often major. For example, the Johns-Manville company now faces tort claims that exceed its value as a firm. It has sought the protection of bankruptcy and has considered transferring its asbestos-related activities to a newly created subsidiary.[3] These drastic responses seem poor substitutes for full insurance. Johns-Manville's current plight may have resulted from its failure to foresee the full extent of the harm that asbestos could cause. The asbestos cases thus raise troublesome bankruptcy and corporate law problems because of products liability law's prior resolution; the courts, that is, seemingly have imposed an unanticipated liability on the asbestos firms.

If the firms should have anticipated the asbestos risk, then the problems are the necessary price of encouraging firms to discover harms and of compensating victims for firm misbehavior. But suppose that private firms would not normally discover the full extent of these risks. Is it possible for courts to identify with acceptable precision those risks that firms should not discover? If so, should courts make firms bear such risks? Are the present strains in corporate and bankruptcy law attributable to products liability law rules that impose liability on firms for undis-

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in the new code so that a possibility exists that a claim for injuries not yet incurred is provable. See, for example, Thomas H. Jackson, Translating Assets and Liabilities to The Bankruptcy Forum, 14 J. Legal Stud. 73 (1985); Note, The Manville Bankruptcy: Treating Mass Tort Claims in Chapter 11 Proceedings, 96 Harv. L. Rev. 1121 (1983); Note, Mass Tort Claims and The Corporate Tortfeasor: Bankruptcy Reorganization and Legislative Compensation versus The Common-Law Tort System, 61 Tex. L. Rev. 1297 (1983).

[2] An interesting paper that describes the characteristics of toxic substances in considerable detail is Talbot Page, A Generic View of Toxic Chemicals and Similar Risks, 7 Ecology L. Q. 207 (1978). See also Symposium, Federal Regulation of the Chemical Industry, 46 L. & Contemp. Probs. 1 (C. Schroeder ed. 1983).

[3] Many of Johns-Manville's activities are described in Mark J. Roe, Bankruptcy and Mass Tort, 84 Colum. L. Rev. 846 (1984).

coverable risks? And if so, how strongly should these strains count against those products liability rules? This paper addresses these questions.

Section I defines a "remote" risk as the risk that a product is more dangerous than a firm would predict if it had done the cost-effective amount of research into safety. A legal rule would impose remote risks on firms if it held them liable whenever their products turned out to be less safe than expected, even though the firms had researched appropriately and warned on the basis of what that research disclosed. Section I argues that this rule raises a fairness concern because firms cannot warn about danger levels that they cannot reasonably be expected to discover. A "knowable" risk is the risk that a product is as dangerous as a firm would predict on the basis of doing the cost-effective amount of research, or less dangerous. Section I goes on to derive criteria that would enable courts to distinguish between remote and knowable risks with acceptable accuracy. Section II next shows that to hold firms liable only for failing to warn of knowable risks, that is, for failing to disclose what cost-effective research would reveal, raises corporate and bankruptcy problems that current law largely solves; relatively minor reforms could solve the rest. In contrast, imposing remote risks on firms can create difficulties both for the firms and for the victims that corporate and bankruptcy law cannot ease, as these laws now exist or could be made to exist.[4] The fairness concern with imposing remote risks that Section I raises, together with the difficulties that Section II identifies, suggests that courts should not require firms to bear remote risks unless they have compelling instrumental or justice reasons to do so. Section III then argues that no one could plausibly have such reasons; rather, the victims of remote risks have only a humanitarian claim to relief, which society should meet, but not through the vehicle of private law suits.[5]

[4] Imposing risks that firms did not anticipate also produces strains in the civil litigation system. An industry has arisen to choose a dispute resolution system best suited to the asbestos cases. See, for example, David Rosenberg, The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System, 97 Harv. L. Rev. 51 (1984); Francis McGovern, Management of Multi-Party Toxic Tort Litigation: Case Law and Trends Affecting Case Management (unpublished manuscript, Boston Univ. Law School 1983). The civil litigation system is not my concern, but that it is being severely taxed is consistent with the view argued for here, that imposing remote risks on firms creates substantial costs for many parties and the state.

[5] This paper deals with the problem of remote risks in a general way. It therefore does not "solve" the asbestos cases. The asbestos manufacturers may have failed to anticipate the asbestos risk or the full advent of strict liability in tort, or both. I am not concerned with legal retroactivity. The full reach of strict tort liability is now known, while toxic risks seem to be widespread, and many of them may be remote. Thus the more important products

I. Remote Risks

A. *Remote Risks and the Law*

Two products liability rules relating to toxic substances exist. Both exculpate firms if they warn adequately against the harm that a product may cause, but they differ in their definitions of adequacy. One rule holds a firm liable if its warning did not correspond to the product's true propensity to harm, as determined on the basis of hindsight after harm has occurred. Under this rule, the firm's knowledge of dangerousness when it issued the warning is irrelevant.[6] The second rule imposes liability only if a firm's warning did not correspond to what the firm knew or should have known about dangerousness at the production stage and so focuses attention on the firm's ex ante behavior.[7] This paper argues that courts should use a modified version of the second, ex ante, rule.

Three objections are made to rules that exculpate firms that warn. One holds that warnings about dangerousness cannot be efficaceous. This objection may rest on the difficulty of representing in words what really is a probability distribution of possible harms, or on notions of cognitive error—people may not be able to process or respond sensibly to information about differing likelihoods of personal danger. I will put this objection aside, not because it lacks force but because, if it is true, it impeaches any disclosure solution to products liability problems; disclosure solutions are beyond this paper's scope. Hence I assume that "adequate" warnings provide consumers with sufficient information about harm. A second objection runs only to the first rule: that rule requires a firm's warning to match the product's true degree of dangerousness, and the objection is that the rule may require a firm to warn when it could not have warned

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liability question is what courts should do when harms materialize that were difficult to anticipate. I do use the asbestos problem paradigmatically, but only because that problem is well known and relatively easy to follow. Epstein claimed that the asbestos companies legitimately failed to foresee the changes in products liability law. Richard A. Epstein, Manville: The Bankruptcy of Product Liability Law, Regulation, September–October 1982, at 14. The retroactivity issue is examined in greater detail in Gary T. Schwartz, New Products, Old Products, Evolving Law, Retroactive Law, 58 N.Y.U. L. Rev. 796, 813–28 (1983).

[6] Cases that hold the manufacturer's knowledge of risk at the time of production to be irrelevant to the imposition of liability are collected in John W. Wade, On the Effect in Product Liability of Knowledge Unavailable prior to Marketing, 58 N.Y.U. L. Rev. 734, 757 n.83 (1983). See also Louis R. Frumer & Melvin L. Friedman, Products Liability § 16A [4](f)[vi] (1978). An influential early argument for this approach is W. Page Keeton, Products Liability—Inadequacy of Information, 48 Tex. L. Rev. 398 (1970). See also Gary T. Schwartz, Foreword: Understanding Products Liability, 67 Calif. L. Rev. 435, 482–88 (1979); Guido Calabresi, Concerning Cause and the Law of Torts, 43 U. Chi. L. Rev. 69, 93 (1975).

[7] For example, Woodill v. Parke Davis & Co., 58 Ill. App. 3d 349, 374 N.E.2d 683 (1978)

because it would not have known of the danger at production time; requiring a firm to do what seemingly cannot be done is unfair. The third objection runs only to the second rule, which exculpates a firm if its warning corresponded to what it should have known about dangerousness ex ante. The objection is that it is impossible to apply the standard "should have known" in a principled way. Section I*A* takes up the second and third objections, beginning with the latter.

One possible way to decide what a firm should have known is to ask whether the relevant risk was foreseeable, or "reasonably" foreseeable, but this method founders on a well-known description problem: whether a risk is foreseeable depends on how it is described, and the choice among possible descriptions is arbitrary. For example, the asbestos manufacturers in the 1930s knew that asbestos caused harm. If the asbestos risk is described as "the risk that asbestos is harmful to persons," it was foreseeable; indeed, it was foreseen. On the other hand, the manufacturers seemingly did not know that very grave harms could occur from relatively low levels of exposure. If the asbestos risk is described as "the risk that asbestos causes the harms that now are seen to result from low exposure levels," the risk was difficult to foresee and was perhaps not foreseen. No principled way exists to choose between these two descriptions or others.

A second way to decide what a firm should have known is to ask, not whether a risk was actually appreciated, but whether it was "discoverable" given the level of scientific knowledge at the time.[8] This method also is arbitrary because it necessarily presupposes a unique set of research conditions that cannot be isolated in a principled fashion. Was an unanticipated risk "discoverable," given then current scientific knowledge, if it would have been revealed only by a crash government program—an asbestos Manhattan Project? Was a risk discoverable if a combined industry effort would have revealed it? If a single firm would have, had it devoted 20 percent of income to a research effort? Thirty percent?

The seemingly inevitable arbitrariness involved in distinguishing between knowable and unknowable risks has led some commentators to argue for the rule that imposes risks on firms regardless of what they knew at production time, and some courts have been persuaded.[9] Other courts

[8] See, for example, Beshada v. Johns-Manville Prods. Corp., 90 N.J. 191, 447 A.2d 439 (1982); Note, Strict Liability and the Scientifically Unknowable Risk, 97 Marq. L. Rev. 660 (1974).

[9] See cases cited in the authorities collected in notes 6 and 8, *supra*. The New Jersey Supreme Court recently drew back from Beshada to create a compromise rule: a firm is liable only if its warning failed to conform to what it knew or should have known at the time of sale, but the firm has the burden of proving that it was justifiably ignorant. See Feldman v. Lederle Laboratories, 97 N.J. 429, 479 A.2d 374 (1984).

have allowed juries to impose risks on firms when the evidence suggested at most that firms knew a risk existed, rather than that they knew its real extent.[10] Yet the notion that firms are justifiably ignorant of some risks often seems intuitively plausible. No one would expect an aspirin manufacturer to take precautions against the possibility that aspirin will cause toes to fall off. Indeed, a rule that exculpates firms for risks of this type is implied by widely shared notions of fairness: the aspirin manufacturers meant no harm and were not negligent; hence they had no real chance to protect themselves against a large liability. If they are required to bear it, this must be because their fairness claim should be sacrificed to the state's instrumental goals or because it is subordinate to the moral claims of the victims. Is it possible, then, to make *plausible* a distinction between risks that should and should not have been anticipated in cases closer than that of the aspirin manufacturers? If so, should the manufacturers' fairness claim *prevail* in these closer cases? Section I considers the first of these questions.

Consider this definition: A firm should be considered justifiably ignorant of a risk if the product turns out to be more dangerous than a cost-effective research program would have predicted. The risk of such an outcome is defined as "remote." This paper's precise claim, then, is that courts should adopt a modified version of the second products liability rule: a firm should be held liable unless it warned on the basis of what it knew or should have known at production time; and it should have known the revelations of an optimal research program.

Making application of the legal rule turn on the concept of a remote risk has two virtues. First, this version of the rule eliminates the arbitrariness otherwise involved in distinguishing between risks of which firms should and should not have been aware. Legal outcomes would be a function of measurable entities—the costs of a research program, the nature of the injuries known or likely to occur from a product, and so forth. To be sure, these entities sometimes may be more measurable in theory than in fact; the point rather is that when the distinction between types of risk turns on them, it becomes a distinction that is at least drawable in principle. Perhaps a better way to say this is to refer to the Learned Hand test in tort law, which, put very simply, exculpates a firm when the expected costs of avoiding an accident exceed the expected costs of the accident itself. The only novelty of the approach suggested here will lie in giving content to this test in the research and development context: a risk is remote, put very simply, if the expected costs of a research project that might have disclosed how dangerous the product actually is exceeded the expected

[10] For example, Borel v. Fibreboard Paper Prods. Corp., 493 F.2d 1076 (5th Cir. 1973).

gain from knowing this. Second, the modified rule captures the fairness claim just described. The addressees of the sanctions that products liability law creates are firms; these firms are known to—indeed are supposed to—maximize profits. Hence they will only know what cost-justified inquiries could reveal. To hold them liable for not knowing more is to deprive them of a "fair chance" to protect themselves.

B. A Model of Risk Discovery[11]

Products that create toxic risks hardly ever can be made differently. A firm can market a toxic substance with a warning adequate to its dangerousness or not make the substance at all. Often, though, the firm does not know how dangerous the substance is. This uncertainty creates difficulties of two sorts. First, suppose the firm believes that, on average, the substance will cause only $1,000 in accident-related harms. Then it could sell the substance with no warning or an innocuous warning—"This product may cause harm." Such a strategy is risky because the product could in fact be dangerous; in this event, the firm may bear the full cost because, under current law, an inadequate warning is treated as no warning at all.[12] Second, let the firm believe that, on average, the substance will cause $5,000,000 in harms. Warnings are cheap to draft and distribute in contrast to this exposure, so the firm could then sell the substance with a strong warning: "This product is highly dangerous." Such a strategy is risky in a different way, for the substance may turn out to be safe. In this

[11] The analysis that follows extends to the liability context. Kevin Roberts & Martin L. Weitzman, Funding Criteria for Research, Development and Exploration Projects, 49 Econometrica 1261 (1981). This is an unusual research and development model because it considers the strategy of a single firm. These models are often set in a game-theoretic framework, in which a firm does R & D in response to R & D initiatives of its competitors, or as a way to exclude rivals from a market, and so forth. See Paul Stoneman, The Economic Analysis of Technological Change 30–51 (1983). The Roberts and Weitzman model fits well here because toxic substances, by and large, are homogeneous and cannot be altered; hence each firm in a market has the same research goal—to learn its product's true characteristics. Thus little is lost by beginning with an analysis of a firm in isolation. Section I*C* then briefly extends the analysis to a market context. The analysis here ignores issues of how knowledge of risk diffuses across firms, but rather assumes that when one firm discovers a risk's true extent, all firms instantaneously know of it. This assumption seems plausible, because a firm that discovers a risk ordinarily translates this discovery into the warning it publicly gives; firms can conveniently monitor the public warnings of other firms.

[12] A firm is liable for all damages if its warning is not appropriate to the degree of danger. See, for example, Salmon v. Parke, Davis & Co., 520 F.2d 1359 (4th Cir. 1975). The analysis below assumes that firms will warn correctly, given what they know, because its concern is to see what firms can be expected to know. Cooter's comment to this paper shows that this assumption is strong; under strict liability, firms will overwarn. This analysis does not affect the results reached here. See Robert Cooter, Defective Warnings, Remote Causes, and Bankruptcy: Comment on Schwartz, in this issue.

event, the strong warning would lose the firm sales, with no corresponding gain. The firm, though, has a third choice: rather than warn too softly or strongly on inadequate evidence, it could do research into the substance's actual dangerousness. If the firm obtained better information about how harmful its product was, it could then choose a warning level that would be more likely to minimize the losses to it from either over- or underwarning. Hence, the gain to a firm from research is the expected additional profit it would earn from acting on more rather than less information about product safety.

If firms were liable *whenever* they warn inadequately—if firms bear remote risks—would they always research until they discovered all significant dangers? The answer is no. Rather, the extent to which a firm would research a product's dangerousness is a particular function of the expected benefits from a research project, the apparent certainty with which these benefits would be obtained, and the costs of the research program. To begin, a firm faces a distribution of possible profits from its product's sale; the firm could earn much or little, depending on how suitable to the actual danger its warning is. Distributions commonly are characterized by two values, their mean—the average of all outcomes—and their standard deviation. Let m be the mean of the possible profit distribution from sale of a product whose harm-causing properties are not fully known. The size of m is a function of how dangerous the firm perceives the product to be. To see why, suppose the firm believes the product is very dangerous and so gives a strong warning: "This one will just about kill you for sure." Then the firm will incur almost no liability but make almost no sales; its profits will be low. Let the firm instead omit a warning. Then sales will be up but the firm risks incurring large liabilities. Hence, whether the firm warns or not, the more dangerous it thinks the product is, the lower m will be, for m is the mean of the firm's beliefs respecting profitability. And conversely, m will shift up as the firm thinks its product is safe, for then it can give a softer warning, thereby increasing sales, or can give no warning without risking as much in liability.

The standard deviation measures a distribution's spread; two-thirds of the outcomes in a normal distribution—the bell-shaped curve—fall within one standard deviation from the mean.[13] Thus, the larger is a distribution's standard deviation, the wider is its width. Here let σ be the standard

[13] See M. J. Moroney, Facts from Figures 62–63 (1965). The benefit distribution is normal if its mean changes roughly continuously with new data, which will occur if small amounts of information change beliefs by a small amount. See Roberts & Weitzman, *supra* note 11, at 1283. The assumption of a normal distribution seems plausible for many research projects.

deviation of the possible profit distribution just described. Then σ is a measure of the uncertainty under which the firm operates. To say that a profit distribution has a large σ is to say that the firm is not at all sure just how dangerous its product is; profits from production could range from negative to large.

A research project to determine the product's actual dangerousness thus has two related functions: it is likely to shrink σ, for the spread of the profit distribution ordinarily will contract as the firm learns more about the product, and research also may shift m, for the mean of possible profits will change if new information suggests the product to be more or less dangerous than originally thought. Research into products such as toxic substances commonly proceeds in stages. At the first stage, the firm can perform a relatively inexpensive but low-powered test, such as the Ames test for mutagenicity; at the second stage, it can begin animal testing; at the third it can commit to a major animal study, and so forth. The firm then has five options: (*a*) not to research at all and not to sell the product; (*b*) not to research at all, but to sell the product and warn on the basis of its initial beliefs; (*c*) to research until completion, defined here as finding out precisely how dangerous the substance is; at completion all uncertainty respecting harm is removed; (*d*) to stop the research project before completion and not to make the product; (*e*) to stop the research project before completion, make the product, and warn on the basis of what it then knows.

The firm's initial decision problem is whether to begin the research project at all; if it begins, the problem becomes whether to proceed to the next stage or terminate. This is an "optimal stopping problem," and to resolve it the firm needs an "optimal stopping rule." Such a rule maximizes expected benefits minus costs at each stage based on information available at that stage, and given that an optimal stopping rule will be used at all future stages. Let C be the expected cost to completion of the project from any particular stage, and suppose the distribution of benefits from research to be distributed normally. Each research stage will disclose a particular benefit mean. Then, we can consider two possible cutoff values for this mean. First, there must be an $\hat{m}_C$ such that if the mean that research discloses, m, is less than or equal to $\hat{m}_C$, the project should be terminated and the product not made. A research result of this sort would indicate that the product is apparently so highly toxic that the chance that further research will reveal safety is too small to be worth pursuing. Second, there must be an $\tilde{m}_C$ such that when $m \geq \tilde{m}_C$, the research project should be terminated and the product made. A research result of this sort would indicate such a high degree of safety that the chance that further research will alter this belief again is not worth pursuing. Then, only when

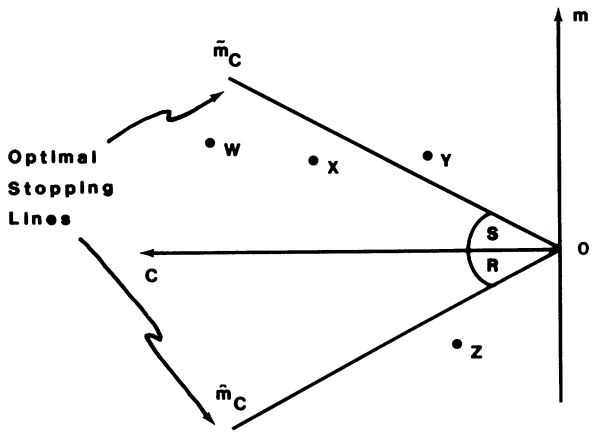

FIGURE 1

$\hat{m}_C < m < \bar{m}_C$ should the firm continue to research. At each stage—for each value of C—an $\hat{m}_C$ and an $\bar{m}_C$ exist, so an optimal stopping function also exists. The firm can therefore calculate the expected net value of a research project at any stage as a function of m and C. Thus we can write a valuation function for a project, $V(m_C, C)$, that gives the project's value when an optimal stopping rule is followed.

The operation of the optimal stopping rule and the valuation function can be clarified with a picture (Figure 1). The vertical axis plots the set of possible benefit means that research discloses. The horizontal axis plots the successive stages of research. These stages are measured from left to right, so increased expenditures on research move the firm toward the vertical axis. Points W, X, Y, and Z each represent estimates of expected profitability that various levels of research expenditure generate. A point on the vertical axis ($C = 0$) represents perfect knowledge of dangerousness and thus profits from sales. The two rays, $\bar{m}_C$ and $\hat{m}_C$, are "optimal stopping lines"; each of them plots the set of cutoff points that tell the firm when further research is not worthwhile.

Figure 1 shows that it pays to stop researching when the expected profits from sale become high or low relative to the amount of additional research available to the firm. For example, let a firm's initial estimate of profitability be at point W. There $\hat{m}_C < m < \bar{m}_C$, so the firm will begin a research project. If early results reveal a profit mean such as X, the firm will continue to research. But if further results reveal that the firm is at points Y or Z, the firm would terminate the research project. At Y, which is above the positive optimal stopping line, the likelihood that further research would reveal serious danger—unprofitability—is so low that the

firm's best strategy is to market the product, warning on the basis of what it then knows. At Z, the product is so likely to be highly dangerous that the firm's best strategy is not to make it at all.

Figure 1 also shows that firms will almost never have perfect knowledge about safety; research results will cause a firm to hit one or the other optimal stopping line before the vertical axis is reached. This result is consistent with experience. Perfect knowledge about the harm-causing propensities of complex products, such as toxic substances, simply does not exist. For example, scientists now identify actual carcinogens by observing how substances affect animals and persons, not from theories that predict dangerousness from the substances' chemical structure. The former method cannot yield certain answers when applied to new products.

The two optimal stopping lines in Figure 1 are represented as rays out of the origin. To see why this is so, recall that I wrote a valuation function for a research project, $V(m_C, C)$, that gives its value when an optimal stopping rule is followed. This valuation function is an expected monetary value that is measured in the same units as m, C, and V.[14] Research and development models commonly assume constant marginal rates of substitution between research inputs and outputs;[15] for example, if inputs into research are doubled, research output doubles also. This means here that σ shrinks in direct proportion to the costs incurred in research. Now the valuation function for a project with constant returns is linearly homogeneous—a straight line. Then for a fixed σ we can write V in the functional form: $V(m, C) = mg(m/C)$, which is linear.[16] We can let $\hat{m}_C/C = R$ and $\tilde{m}_C/C = S$ and solve for the optimal stopping function: this function will actually consist of two rays out of the origin—the "optimal stopping lines"—which are $\hat{m}_C = RC$ for all R and $\tilde{m}_C = SC$ for all S. These lines have slopes of R and S, respectively.

[14] This paragraph is fairly technical. Readers uninterested in the derivation of the optimal stopping lines can move to the next paragraph without losing the sense of the argument.

[15] See Stoneman, *supra* note 11, at 4.

[16] A production function is homogeneous of degree k if, given any positive constant t, $F(tK, tL) = t^kF(K, L)$. There are increasing returns to scale when k is greater than one, decreasing returns when k is less than one. With constant returns to scale $k = 1$, and so $F(tK, tL) = tF(K, L)$. A function that has constant returns to scale is linearly homogeneous. We have assumed that the production function for a research project, $V(m, C)$, is linearly homogeneous, and so we can substitute m for K, C for L, and λ for t and write: $V(m, C) = \lambda V(m/\lambda, C/\lambda)$ for all $\lambda > 0$, where λ is a positive constant. Because this equation holds for all values of $\lambda > 0$, we can let $\lambda = C$. Then $V(m, C) = CV(m/C, 1)$. Define $g(m/C) = (C/m)V(m/C, 1)$. Solving this yields $mg(m/C) = CV(m/C, 1)$. But we know that $CV(m/C, 1) = V(m, C)$. Hence, $V(m, C) \equiv mg(m/C)$, which is the equation in the text. Because $V(m, C)$ is linearly homogeneous, it describes a ray through the origin.

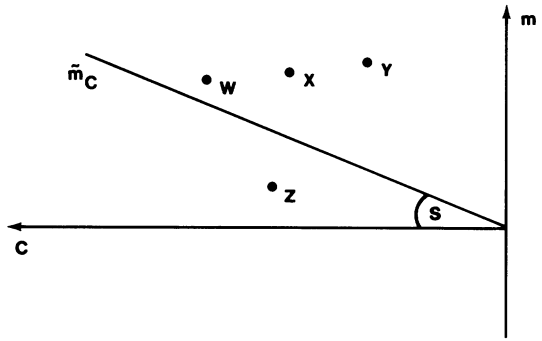

FIGURE 2

Figure 1 shows that the slopes of the optimal stopping lines are important determinants of how much research is done. For example, the smaller is S in Figure 1, the flatter is the positive optimal stopping line, and the more likely is the firm to sell without doing very much research. As another illustration, observe Figure 2, in which only positive values of m are considered. Because S is so small, points W, X, and Y from Figure 1 lie above the optimal stopping line; if the firm is at any such point, it will sell without doing further research. Research would be done were the firm at point Z, but then the benefit mean must be low—that is, early research would indicate a relatively high likelihood of danger.

The slope, S, turns out to vary directly with the standard deviation of possible benefits, σ, and to vary inversely with research costs, C.[17] This result is intuitively plausible. When σ is high, considerable uncertainty about a product exists, so the firm has an incentive to research; and when C is low, research is inexpensive, so again the firm is likely to do it. But if the firm perceives σ to be small or C to be high, and the product has a good chance of being profitable, the firm's best strategy is to sell it without full research; in this circumstance, S is then small, so the world looks to the firm like Figure 2. To summarize, the model shows that the amount

[17] Roberts and Weitzman first show that what we have called the slope parameters R and S are symmetrical about the horizontal axis with $S = -R$. As these are probability distributions, it can be shown that $1 = g(S) - g(R)$ and, by a fairly complex mathematical analysis, it turns out that

$$1 = E(Z|Z \geq S)\left[\frac{\text{pr}(Z > S)}{1 - 2\text{pr}(Z \geq S)}\right],$$

where $Z \sim N(\sigma, \bar{\sigma}^2)$ and $\bar{\sigma} = \bar{\sigma}_C/C$. Doing comparative statics shows that S increases when $\bar{\sigma}$ increases or when C decreases. See Roberts & Weitzman, *supra* note 11, at 1285–86, 1270.

of research a profit-maximizing firm will do to discover how dangerous a product is depends on three variables: the mean of the profit distribution if the firm were to sell without doing further research; the variance of this distribution—the amount of uncertainty about dangerousness; and research costs.

These criteria may illuminate the asbestos cases. The asbestos companies issued mild warnings to their own workers but warned no one else, nor did they perform tests to determine the actual harm that asbestos could cause.[18] In the 1920s and 1930s, asbestos was thought to cause asbestosis, a serious but not invariably fatal disease. Persons thought to be at risk worked in asbestos "textile" factories—firms that manufactured asbestos. These workers were covered under workers' compensation laws. Because asbestosis was thought to be caused only at high exposure levels, workers in other industries, such as those who installed asbestos in ships or buildings, were assumed not to be at risk.[19] Hence, a firm that failed to warn strongly could believe its expected tort liability from asbestos sales to be manageable. That is, the mean of the possible profit distribution from selling asbestos without perfect knowledge of its dangerousness was relatively high.

Firms could have held their view of this mean with relative certainty. This possibility follows from an analysis of government regulations concerning permissible amounts of asbestos in work environments. These regulations were unchanged between the late 1930s and the late 1960s. The first recommended government standard for permissible amounts of asbestos in work environments was adopted in 1938. This standard lasted for thirty years, though it was much more lenient than the current standard. The static nature of the rule implies that little uncertainty existed respecting it. In 1968, the federal standard was lowered considerably for government contractors, to twelve fibers per cubic centimeter. In 1972, the Occupational Safety and Health Administration (OSHA) adopted a standard of five fibers per cubic centimeter, which was "intended primarily to protect employees against asbestosis"; "it was hoped that [the standard] would provide some incidental degree of protection against cancer." The agency did not regulate more rigorously for cancer prevention because the relation between asbestos and cancer was then too obscure. In 1976, OSHA reduced the standard to two fibers per cubic centimeter. All of these standards were too lax, but government scientists then believed that the smaller fibers (as small as one micron) would not be

[18] See Borel v. Fibreboard Paper Prods. Corp., 493 F.2d 1076 (5th Cir. 1973).

[19] See *id.*

retained in the lungs and therefore would not cause asbestosis. These shorter fibers are now known to cause asbestosis and cancer. In 1975, OSHA proposed a reduction in the 1972 standard to .5 fibers per cubic centimeter; that is, by the mid-1970s the 1972 standard was considered to be too lenient by a factor of ten and the 1968 standard was considered too lenient by a factor of twenty-four. Both standards were very much stricter than the 1938 standard. After a struggle with the Supreme Court, OSHA promulgated the .5 fiber standard as an "Emergency Temporary Standard," effective November 4, 1983.[20] Thus firms in the period ending approximately 1958 may have held their view of the high profit mean with relative certainty, which is to say that the spread of possible profits from the sale of asbestos, σ, probably was perceived as small.

Finally, laboratory testing of carcinogenic substances neither was then nor is now well developed, nor are results from animals easily extrapolated to human beings. It is not surprising that the true extent of the asbestos disaster was revealed only by a retrospective study of workers who had been heavily exposed in similar circumstances.[21] An asbestos manufacturer would have had great difficulty conducting a retrospective study of workers whom it did not employ and whose exposure experiences differed widely among industries; and prospective tests for potentially carcinogenic substances are notoriously hard to do.[22] Thus, for a given firm, the costs of a project researching the dangers of asbestos, C, were likely to be high.

The model just set forth shows that when σ is small and m and C are

[20] Documentation for this paragraph may be found in 78 Fed. Reg. 5108b and following (4 November, 1983); Comment, Asbestos Litigation: The Dust Has Not Yet Settled, 7 Fordham Urb. L. J. 55 (1978); Gary Treiger, Relief for Asbestos Victims: A Legislative Analysis, 20 Harv. J. Legis. 179, 192–96 (1983). Richard Epstein also argued that the asbestos companies did not know the full extent of the asbestos risk. See Epstein, *supra* note 5. For a contrary view, see Ronald Glotta & Janette Sherman, Learning from the Lessons of the Asbestos Tragedy: A Reform Proposal, 19 Trial 68 (No. 11, 1983) ("Sufficient scientific information existed no later than 1941 to avoid the 'asbestos tragedy.' " *Id* at 70). Two cases have affirmed jury verdicts imposing punitive damages on asbetos companies. Moran v. Johns-Manville Sales Corp., 691 F.2d 811 (6th Cir. 1982); Neal v. Carey Canadian Mines, Ltd., 548 F. Supp. 357 (E.D. Pa. 1982). These cases erroneously equate full information with knowledge that a product *may* be dangerous, apparently because they believe it to be unpardonable not to research fully or warn scaringly when one knows that (an unspecified amount of) harm might occur.

[21] This is the famous Selikoff study, which is described in authorities cited in note 20 *supra*.

[22] The difficulties of testing for carcinogenity are well described in Stephen Breyer, Regulation and Its Reform 135–41 (1982); Milton C. Weinstein, Decision Making for Toxic Substances Control: Cost-Effective Information Development for the Control of Environmental Carcinogens, 27 Pub. Pol'y 333 (1979).

high, firms are likely to warn weakly and do little research, even when they are required to bear all risks. Section I*C* next shows that the model also applies when firms operate under a rule that requires them to warn only of risks of which they should have been aware. The asbestos manufacturers operated under a rule much like this in the 1930s and 1940s. That they acted in the way the model predicts—issuing weak warnings and not conducting tests—is therefore unsurprising. The asbestos risk may have been remote.

The model used here supposed a particular kind of research project, one that was conducted in stages and whose outcomes were normally distributed. Other kinds of projects are plainly possible. For example, research results sometimes are discontinuous; sudden breakthroughs occur. I have said nothing formal about research projects of this sort. The exercise here should be regarded more as an invitation to construct a family of models relevant to the toxic risk problem than as a complete description of the toxic risk research process. Nevertheless, many real research projects approximate the conditions of the model, and the conduct of most projects is likely to be a function of the mean of expected benefits, the distribution of that mean and the costs of research, interacting much as the model describes.

C. Lessons

In the model, firms bore remote risks; a firm knew it would be liable whenever its warning was inadequate to a product's actual dangerousness. The analysis implied that a substantial set of risks would remain incorrectly estimated under this assumption. A safety-based justification for imposing remote risks on firms must then be that the set of underestimated risks would grow were firms required only to warn of what they actually knew or of what optimal inquiries would disclose. This justification is false if decision makers can ascertain the criteria, developed above, that determine the optimal research program. To see why, let a firm believe that (i) it will be held liable only for failing to warn concerning risks whose value it knows or can optimally discover; (ii) a court or jury will later decide independently what the scope of an optimal inquiry was; (iii) the court or jury can determine the precise values of m, σ, and C as the firm did or should have viewed them ex ante. In these circumstances, the firm will research only when and for as long as the three decision variables m, σ, and C direct it to; were the firm to do less, the court or jury would hold it liable, and the firm could not do more. The oversight function of the court and jury, that is, induces the firm to behave optimally on the basis of what it knows, which is just the behavior the model describes.

Therefore, imposing only knowable risks on firms cannot reduce the set of risks that firms will discover; the modified second liability rule described in Section IA should govern.

Next, consider two objections to this conclusion. The first supposes the *full set* of ex ante research opportunities to be private information to firms. A rule imposing only knowable risks would then create disincentives to research fully: a firm might ignore low-cost research opportunities with a high likelihood of revealing dangerousness; instead, it would sell the product with a weak warning, claiming when it was sued that the only research opportunities open to it were so costly that the failure to pursue them was efficient. If the full set of research opportunities actually is private information to firms, plaintiffs could not disprove these claims. In contrast, holding firms liable on the basis of what is known ex post would eliminate the incentive of firms to forgo and later conceal the existence of efficacious low-cost research techniques.

This objection is unpersuasive because the research opportunities at issue actually are public knowledge. These "opportunities" entail using standard medical tests that increase knowledge of such health hazards as carcinogenicity. The circumstances under which any of these tests will do this and their cost are common knowledge in the medical community at any given time. Consequently, the issue in the cases I discuss is not whether a defendant firm had opportunities to do research but whether it should have exploited more fully the research opportunities that were available to all firms. This issue seems easier for a plaintiff to litigate than the analogous issue in the typical design defect case—whether defendant had available to it, *or could have developed,* an alternative, safer product design. Therefore a rule imposing only knowable risks on firms will not create disincentives to research stemming from a supposed inability of plaintiffs to establish that potentially useful research opportunities existed ex ante; there is no such inability.

A second objection to my claim that forgoing remote risk impositions creates no disincentives to research seemingly follows from the correct view that decision makers could reconstruct the other decision variables, σ and m, only to a rough approximation. To the extent that this difficulty exists, however, firms will be induced to pursue excessive rather than inadequate research programs. To see why, one should realize that when these variables cannot be measured precisely, the decision maker may err. Thus, if courts seek to impose only knowable risks on firms, a firm nevertheless faces a positive probability of bearing a remote risk; it may be found liable for an inadequate warning though it acted optimally in not discovering the product's actual dangerousness. For toxic substances, this liability may be large. Also, the probability that the firm will incur

liability is partly a function of the *amount* of research that it does; for if the decision variables cannot be measured precisely, the firm's ex post claim to have behaved optimally is the more persuasive, the more research it actually did. When a firm faces a positive probability of being found liable even though it behaved optimally, this liability is large, and its likelihood is partly a function of the firm's own behavior, then the firm has an incentive to be more careful than a cost-benefit calculation alone would dictate.[23] In our terms, a firm will do more research than would be optimal if courts and juries could measure m and σ exactly.

It may be thought, then, that an efficiency justification for imposing remote risks on firms is not that this would prevent insufficient research into toxic risks but that it would prevent too much. Were *all* risks imposed on firms, a particular firm's liability would no longer be a function of how much research it actually did; hence, it would do only the optimal amount. On the other hand, imposing remote risks increases the uncertainty under which firms must function and may unduly restrict the number of firms. The public-good aspect of research also causes firms to do too little of it; consequently, whatever excess research is induced by the rule argued for is a useful counterweight.[24] Finally, Section II shows that imposing remote risks on firms will cause significant economic dislocations should those risks materialize. Efficiency concerns therefore do not imply holding firms liable for remote risks.

II. Corporate Structure and Bankruptcy

Analyses of the relationship among tort, corporate, and bankruptcy law do not distinguish between remote and knowable risks. This failure underlies much of the difficulty that the latter two bodies of law have experi-

[23] This analysis derives from John Calfee & Richard Craswell, Some Effects of Uncertainty on Compliance with Legal Standards, 70 Va. L. Rev. 965 (1984). A similar analysis is made in Robert D. Cooter, Economic Analysis of Punitive Damages, 56 S. Cal. L. Rev. 79 (1982).

[24] Research into safety has a public-good aspect because a firm that does the research will then issue profit-maximizing warnings; these warnings are public and can be copied by other firms. Steven Shavell also points out that research into risk has a public-good aspect and concludes that when this aspect is important, the government should do much of the research. See Shavell, Liability for Harm versus Regulation of Safety, 13 J. Legal Stud. 357 (1984). See also John M. Hartwick, Optimal R & D Levels When Firm j Benefits from Firm i's Inventive Activity, 16 Econ. Letters 165 (1984). This view is correct; the text argues only that a "negligence" standard can ameliorate the public-good problem, not eliminate it. Finally, imposing remote risks may be thought desirable because it would cause firms to develop tests that predict dangerousness better. This argument seems fanciful because such tests are parasitic on basic research into the fundamental nature of disease; private firms rarely, if ever, do such basic research.

enced in dealing with situations such as the asbestos cases. Section II*A* thus puts remote risks aside to consider the corporate and bankruptcy aspects of knowable risk impositions. It shows that when risks are knowable, in the sense developed in Section I, the law now makes it difficult for firms to shift risks they can more cheaply bear or to avoid paying valid claims. Further, legal reforms that would altogether preclude these forms of misbehavior are relatively convenient to adopt. Such reforms include reducing the protection that limited liability confers on firm owners; increasing the reach of the successor liability doctrine; and preventing firms from discharging in bankruptcy claims based on injuries that have yet to arise. Section II*B* then returns to the remote risk concern to show that imposing remote risks on firms creates two related difficulties: first, victims often will be undercompensated; second, firms will attempt to avoid liability, and their efforts will cause substantial welfare losses. Current corporate and bankruptcy laws deal badly with these difficulties but neither the reforms just discussed nor others would help. The most important factor that drives the analysis Section II makes is that firms generally will or can be induced to insure against knowable risks or not to operate, while firms will not insure remote risks to their full extent. To summarize, Section II argues that, when corporate and bankruptcy law aspects are considered, remote risk impositions not only may be unfair, as Section IA suggested, but also will frustrate the law's compensation and efficiency goals.

A. Knowable Risks and the Externalization Problem

1. The Delayed Risk Concern

Persons and firms who insure fully against the accidents they may cause obviously can compensate victims. Also, although a person or firm who insures fully does not necessarily face the correct incentives to take care,[25] reducing the incentive to insure by excusing actors from the full costs of the accidents they cause is unsound. Nonetheless, the law creates incentives not to insure fully. Accident victims can draw primarily on an individual tortfeasor's tangible wealth to satisfy tort judgments entered against him, yet when claims exceed tangible wealth, victims cannot also draw on the tortfeasor's human capital by forcing him to devote a fraction

[25] If a firm can influence the probability that a loss of given magnitude will occur without also influencing that magnitude, purchasing insurance creates a moral hazard problem; the firm is covered against all loss no matter how much care it takes, so it has an incentive to take little care. The moral hazard problem disappears if insurance companies can monitor care.

TABLE 1
EFFECTIVE INSURANCE COST OF PROTECTING WEALTH

Tangible Wealth that Insurance Protects ($) (1)	Largest Expected Liability ($) (2)	Coverage Purchased ($) (3)	Premium per Dollar of Coverage (4)	Total Premium (3) × (4) (5)	Effective Price per Dollar of Protection (5) ÷ (1) (6)
10,000	5,000	5,000	.05	250	.05
10,000	10,000	10,000	.05	500	.05
10,000	20,000	20,000	.05	1,000	.10
10,000	40,000	40,000	.05	2,000	.20
10,000	80,000	80,000	.05	4,000	.40

of his future earning capacity to paying compensation. Indeed, a bankruptcy option exists: when liability judgments exceed tangible wealth, the defendant can offer up only that wealth and then have tort judgments discharged in bankruptcy. Hence individuals have a form of limited liability, which dilutes their incentive to insure fully when the largest expected liability they face exceeds their tangible wealth.

To see how this dilution functions, suppose that Jones has $10,000 in wealth and faces a linear insurance premium schedule, where $.05 buys $1.00 of coverage no matter how much coverage is taken. Then consider Table 1. Because the tangible wealth that insurance protects remains constant while the premium necessary to protect this wealth rises with coverage purchased, the price per dollar of actual protection also must rise: in the illustration, when the largest expected liability is fifty percent of tangible wealth, the price of protecting a dollar of this wealth is $.05; when the largest expected liability is four times tangible wealth, the price rises to $.20. Given limited liability, the incentive to insure thus varies inversely with (*a*) the difference between the largest possible liability and tangible personal wealth and (*b*) the probability that liabilities significantly exceeding tangible wealth will be incurred. Respecting this second factor, when the probability of such large liabilities is high, Jones will believe herself likely to be in the state where insurance is relatively expensive per dollar of protection, and so she has a lessened incentive to insure. On the other hand, if she does not insure, she may actually become bankrupt. Persons dislike bankruptcy and strive to avoid it. Consequently, Jones faces conflicting incentives about whether to insure fully when the largest liability she may cause exceeds her tangible wealth.

A recent paper on the decision to purchase automobile liability insurance showed that a person will insure if the premium he would pay to

equalize his income in all possible future states of the world exceeds the expected value of the uncollectible claims against him if he purchases no insurance.[26] Thus, if the largest expected liability in the illustration above were $20,000 and would be incurred with a probability of .01, Jones would insure if she valued never being bankrupt at more than $100:.01 ($20,000–$10,000). In formal terms, let L equal the largest liability against Jones if she negligently injures another and let W be Jones's wealth. Then let P be the premium she would be willing to pay to avoid bankruptcy and p be the probability that L is incurred. The expected value, e, of uncollectible claims above Jones's wealth is then $p(L - W) = e$, and Jones will insure against L if $P > e$. This model shows that the likelihood of purchasing insurance for an individual varies directly with the amount of wealth a person has (W) and his desire to keep it (P), and varies inversely with the probability of a crushing accident (p) and its size (L) in relation to one's wealth. To return to the illustration, when p is high and $L - W$ is large, e also will be large. The larger e is, the less likely it is that $P > e$, and so the less likely it is that Jones would purchase full insurance. The data show that approximately 20 percent of persons either fail to insure or underinsure for automobile accidents.[27]

A difficulty with this model is that the risk premium, P, is unspecified; it is just a function of risk aversion. But P can be given more content if we

[26] See William R. Keeton & Evan Kwerel, Externalities in Automobile Insurance and the Underinsured Driver Problem, 27 J. Law & Econ. 149 (1984).

[27] The data are ambiguous because they do not account for people's risk perceptions. For example, if people underestimate the likelihood that they will injure others, they may buy too little insurance; the converse holds if they overestimate this risk. Hence it is difficult to isolate the contribution of "limited liability" to people's decision to insure. That contribution is unlikely to be zero, though. Results similar to those that Keeton and Kwerel derive are found in Gur Huberman, David Mayers, & Clifford W. Smith, Optimal Insurance Policy Indemnity Schedules, 14 Bell J. Econ. 415 (1983). These authors call attention to the role of bankruptcy exemptions, which allow a person to retain substantial tangible wealth—two cars and a house, sometimes—though he declares bankruptcy. They then show that when the largest possible liability is high in relation to wealth, purchasing less than full insurance though risking bankruptcy may generate greater expected utility than paying large insurance premiums. The only paper I have seen that considers a corporation's demand for insurance is David Mayers & Clifford W. Smith, On the Corporate Demand for Insurance, 52 J. Bus. 281 (1982). These authors attribute the demand for liability insurance to insurance company efficiencies in settling claims and, relative to creditors, in monitoring firm behavior. Respecting the latter, a firm may lower its interest rate on loans retroactively by adopting projects with a high risk of causing harm after it borrows. Interest rates will reflect this possibility. The existence of liability insurance, however, signals to lenders that insurance companies are monitoring to prevent such misbehavior and so keeps interest rates down. The difficulty here is that there appears to be no way to specify how much insurance on activities that firms have yet to perform would constitute an adequate signal. Put more simply, Mayers and Smith do not address the question the text next takes up, which is how much insurance it is optimal for firms to buy.

consider an entrepreneur deciding whether to begin a corporation that will have limited liability. This is because for a firm, unlike a private person, future existence (and hence all future earnings) depend on avoiding bankruptcy. Much of the wealth of individuals is their human capital, their ability to work productively, which they retain after bankruptcy. In contrast, a bankrupt firm must cease operations, for its wealth is largely its physical capital, which creditors can take. Firms are valued as perpetuities: if I equals net expected earnings per year and r is the firm's cost of capital,[28] the value of a firm's earnings in perpetuity, V, is equal to I/r. An entrepreneur who insures his firm against liabilities, even when those liabilities could exceed the firm's assets, thus secures I/r always. The risk premium for an entrepreneur thus depends importantly on his firm's expected future earnings; the higher they are in relation to the wealth that must be contributed to begin the firm, the more likely is the firm to be fully insured, even against liabilities that will exceed this wealth.

This analysis has two useful implications. First, when a risk is knowable, an entrepreneur who sets up a manufacturing firm is likely to have it insure fully, despite the existence of limited liability. This follows, first, because such firms commonly possess substantial wealth in the form of physical capital and, second, because entrepreneurs will expect to earn a significantly higher return on this wealth than the risk-free return—the rate on Treasury bills. Otherwise, it is pointless to start the firm. When wealth is high, expected income thus is high in absolute terms. And when a firm has substantial wealth that is at risk to victims and earns a high income, it is likely to insure fully, unless its liability exposure greatly exceeds its wealth.

This analysis also suggests that when it pays not to insure fully, it often will pay not to operate the firm at all. A firm is less likely to insure when the probability of an accident (p) is high, it does not earn a large income, and its liability exposure is very high in relation to its wealth. But when p is high, a substantial chance exists that crushing accident costs will materialize early, thereby providing the firm with only a brief period in which to recover start-up costs and earn a profit. If its income is not large, this period will be too brief. For example, suppose that a firm requires $100,000 of wealth to begin; it will earn a relatively high net income on investment of $15,000 a year; its discount rate is .10; its assets depreciate at a real rate of 10 percent a year; accident costs that greatly exceed the

[28] When a firm is deciding whether to do a project that will generate income in the future, it must discount that income to present value to compare it with the present costs of beginning the project. A firm's "cost of capital" is the discount rate it uses. This rate increases with the project's riskiness and the cost of money generally.

firm's wealth will materialize in the very beginning of the third year, and it does not pay the firm to insure. Then the expected value to an entrepreneur of operating the firm without insurance is negative by more than $30,000.[29] The entrepreneur will not insure his firm against all accident costs, but will not begin it either. Therefore, when risks are knowable, manufacturing firms will generally insure fully or not operate.[30]

An exception to this conclusion may exist if accident costs are likely not to materialize for several years after start-up. Let an entrepreneur expect his firm to incur no accident costs for five years; in years six to infinity, accidents will happen, and in each of these years a positive probability will exist of incurring a liability that will exceed the firm's wealth. If it does not pay to insure, the entrepreneur nevertheless would operate if he could earn enough in the accident-free period to recover start-up costs and make a profit. That the risk of accidents is delayed is significant because, other things equal, the longer the accident-free period, the more likely it is that the strategy of operating without insurance will be profitable.

Operation of a firm without insurance when its potential liabilities exceed its assets is plainly undesirable because the firm externalizes risk to victims. The entrepreneur, when deciding what products to make, will not compare the accident costs of victims to the expected gains, but rather will compare only the value of the firm's wealth to those gains. As this wealth, by definition, is less than the victims' costs, entreprenuers may produce too many defective products. Also, when entrepreneurs operate firms in a delayed risk context and do not insure, those firms often will have negative value; that is, the firms could not earn enough to justify

[29] The firm's value in the text is computed by solving

$$V = \frac{I}{(1 + r)} + \frac{I}{(1 + r)^2} - \frac{W}{(1 + r)^3},$$

where V = firm value. The text gives only an approximate answer because, as the model in Section IIA2 next shows, this formula is not exactly right. But on the text's assumptions, that model also shows that the contemplated firm would actually have a substantial negative value were it valued precisely.

[30] Other firms sometimes may operate without insurance. For example, in the famous case of Walkovsky v. Carlton, 223 N.E. 236 (N.Y. 1966), an entrepreneur set up separately incorporated companies, each of which had as its sole asset two taxicabs; these little companies then purchased the minimum insurance that the law allowed. This result is unsurprising. Each "firm" had a relatively small amount of wealth at risk to victims—two cabs; it could incur a liability well in excess of this value; and the income of two cabs is not large relative to the highest damage judgments that could be rendered. In these circumstances, a firm may have an incentive to operate without insurance. As Section IIA2 will show, in these circumstances courts also should pierce the corporate veil to hold the owner personally liable. The New York Court did not do this and so erred.

operation *if* the firms could not externalize risk but instead had to bear it. Operation of negative value firms is undesirable because these firms generate social costs that exceed their social gains. Thus, it is important to ask whether corporate and bankruptcy laws actually do permit entrepreneurs to externalize risk to victims and to operate negative value firms, by establishing companies that function without insurance and then dissolve when accidents happen.

Section II*A*2 models the decision of an entrepreneur considering whether to establish a firm in a delayed risk context and, if so, whether to insure against the accidents the firm may cause. It formally derives the conclusions that were just set out intuitively. Readers who dislike models may move to the legal discussion in subsection 3 without losing the thread.

2. A Limited Liability Risk Avoidance Model

The model assumes that (*a*) an entrepreneur, who may be a firm, wants to maximize the expected value of a business that will make a product; (*b*) the product causes injuries to users some years after sale; (*c*) the entrepreneur and insurance companies know this but consumers and workers do not; (*d*) the business that makes the product will not warn adequately against its risk; (*e*) a probability exists that the firm will incur a liability that exceeds its wealth in any year after the accident-free period ends; (*f*) insurance premiums are actuarily fair; the insurance company earns zero profits; (*g*) limited liability exists; (*h*) successor liability does not exist; a purchaser of the firm's assets is not liable for its torts; and (*i*) contingent tort claims are nondischargeable in bankruptcy. The model uses the following notation: I = a firm's expected net income per year; V = net present value of the firm; r = firm's discount rate; W = firm's wealth; t = number of years the firm can operate before it must begin to pay products liability costs; L = largest liability it faces from accidents; p = probability that accidents in the amount of L will be incurred.

In the accident-free period, the firm earns income, valued at $\Sigma_0^t I/(1 + r)^t$. After this period, the firm will earn income in each year with probability $1 - p$ and earn no income while losing all wealth with probability p (L is then incurred). It can be shown[31] that the value to the firm of operating in the years when accidents can happen is $[I - p(I + W)]/[(r + p)(1 + r)^t]$. Hence, we can write the value of the firm without insurance as

[31] The equation the text next gives is the solution to the problem of valuing the firm as an infinite series, in each year of which it will disappear with probability p and continue for another period with probability $(1 - p)$.

$$V_W = \sum_0^t \frac{I}{(1+r)^t} + \frac{I - p(I - W)}{(r + p)(1 + r)^t}. \tag{1}$$

If a firm insures fully, its income is constant over all future states of the world. Hence, its value is

$$V_I = \frac{I}{r} - \frac{\frac{pL}{r}}{(1 + r)^{t+1}}. \tag{2}$$

The second term is the present discounted value of a stream of insurance payments that must be paid beginning in the year $t + 1$; each payment equals the risk (pL) of incurring liability.

The firm's strategy turns on a comparison of these values. If $V_I > V_W$ and V_I is greater than the value the resources at issue would have in another use, the firm will operate with insurance; if $V_I < V_W$ and V_W is the highest-valued use of the resources, the firm will operate without insurance. Otherwise, the firm will not operate. It is useful to compare V_I and V_W.

$$\frac{I}{r} - \frac{\frac{pL}{r}}{(1 + r)^{t+1}} \gtreqless \sum_0^t \frac{I}{(1 + r)^t} + \frac{I - p(I + W)}{(r + p)(1 + r)^t}. \tag{3}$$

Rearranging terms, we get

$$I[(1 + r)(1 - r)p - r(1 + r)^{t+1}(r + p)] \gtreqless rp[L(r + p) - (1 + r)W]. \tag{4}$$

By inspection of (4), we see that the right hand side, V_W, will be negative if $L < W$, for L is weighted by $(r + p)$, which always is less than $(1 + r)$, the weighting factor for W. This says that if the largest expected liability a firm faces (L) is less than the firm's wealth (W), it will *never* pay the firm to operate without insurance; the firm will either insure fully or not exist. When $L > W$, the right-hand side is likely to exceed the left-hand side, V_I, if (i) $(L - W)$ is large; (ii) p is high; (iii) t is long; and (iv) I is large when t is long. The intuition underlying the first two conditions has been set out above. Respecting the third, the longer the accident free period (t), the more likely the entrepreneur is to recover the wealth contributed to the firm and earn a profit—and the less likely the entrepreneur is to have the firm insure, for insurance is bought to protect W so that income (I) is earned. The desire for insurance is weakened a fortiori if I also is large when t is long, which condition iv states. Further, by inspection of equations (3) and (4) we see that V_W is likely to exceed zero when W is small.

This says that the less wealth the entrepreneur must put at risk to victims, the more likely is operation without insurance to be its best strategy.[32]

These inequalities also reveal a striking fact: it can be that $V_I < 0$ while $V_W > 0$. In this event, the existence of limited liability and delayed risk permit an entrepreneur to operate a negative value firm. Such a firm generates social costs that exceed its social gains, for $V_I < 0$ only when the present value of the firm's income stream is less than the present value of the liability risks it creates.

In many cases, when V_I *is* less than V_W and V_W is positive, V_I will be negative; it is profit maximizing to operate without insurance though the firm could not survive if it had to take account of all risks that it creates. Consider this illustration: $I = \$10{,}000$; $r = .10$; $L = \$200{,}000$; $W = \$150{,}000$; $p = .10$; $t = 5$. Then,

$$V_I = \frac{I}{r} - \frac{\frac{pL}{r}}{(1 + r)^{t+1}} = -\$12{,}994.35.$$

$$V_W = \sum_0^t \frac{I}{(1 + r)^t} + \frac{I - p(I + W)}{(r + p)(1 + r)^t} = \$19{,}184.67.$$

The expected value to an entrepreneur of operating a firm without insurance is positive ($V_W > 0$), but the firm has negative value, all costs considered. This firm should not operate, however, for two reasons: it externalizes risk to victims because its liability exposure exceeds its wealth, and it could not pay its way were it made to bear full liability costs ($V_I < 0$).

It is also useful to focus on W, the firm's wealth. In many cases, including those involving toxic products, no single suit will be for an amount

[32] This paper discusses primarily products that cannot be made safer. In a majority of jurisdictions, a firm is held liable for the damages such "unavoidably dangerous" products cause only if the firm fails to warn adequately. Therefore, for such products a warning and full insurance are substitutes. The possibility that a firm could warn rather than insure does not affect the text's analysis. A warning is exculpatory because it conveys full information. Since that is hard to do, firms that warn in fact face positive probabilities that courts will not enforce their warnings. The risk that a firm that issues a warning will bear L is thus not pL but $p \cdot p'L$, where p' is the probability that a court will find the firm's warning to be inadequate. If we let $p \cdot p' = b$ and substitute b for p, the analysis above goes through unaffected. For convenience, the text implicitly supposed p' to be one—see assumption d above. If this assumption is relaxed, firms then would be more likely to insure, for the likelihood of insurance varies inversely with p and $b \leq p$. When a firm can influence the safety of its products, warnings seldom are exculpatory, nor is care if strict liability obtains. In these circumstances, the text's analysis goes through as written, for neither warnings nor care are substitutes for insurance; hence the risk of incurring harm actually is pL.

that will exceed W. Rather, the firm will face a substantial set of suits whose total value may exceed its wealth or it will face almost no suits at all. For example, the firm's product causes cancer or it does not; if the former, there will be many suits; if the latter, none. The first "cancer suit" thus informs the firm that it is in that state of the world where its liability exposure may exceed W. The firm may then sell its assets, distribute the proceeds to its owners and dissolve. If the entrepreneur knows at the beginning that potential victims would have difficulty enforcing judgments against the owners, he also knows that he will not lose W to victims when accidents happen. Rather, if $\overline{W}$ is start-up costs—purchasing machines and the like—plus the goodwill that will be lost when the firm disappears, and if W' is the present discounted value of the proceeds the firm will receive when it sells its assets, the firm will lose $\overline{W} - W'$. This sum is less than W, because we implicitly assumed above that $W = \overline{W}$. And the less the firm will lose to victims when liability is incurred, the more likely is the firm to operate without full insurance.

3. The Possibility of Bad Behavior

a) Limited Liability. That limited liability permits entrepreneurs to externalize tort risks to victims is well known.[33] The literature commonly refers to such victims as "unrelated" because they are assumed not to deal with firms before their injuries and thus cannot compel firms to take risks into account through wage or price bargains. Potential victims who do bargain with firms, however, also may be unable to compel firms to take risks into account if they are uninformed about accident probabilities. In both cases, firms will consider risks only if accident costs are imposed on them through tort judgments. Limited liability reduces the force of this incentive because it permits entrepreneurs to put less wealth at risk to victims than the expected value of the accidents the firms may cause. It is shown here, however, that, at least as regards manufacturing firms, limited liability is a problem more in theory than in life. Entrepreneurs have strong incentives to insure such firms fully against all accidents, and full insurance altogether prevents risk externalization. These incentives, though, are diluted substantially when the harms attributable

[33] A very good analysis is Paul Halpern, Michael Trebilcock, & Stuart Turnbull, An Economic Analysis of Limited Liability in Corporation Law, 70 U. Toronto L. J. 117 (1980). The authors treat limited liability generally, and do not consider products liability problems. A more recent general treatment is Frank H. Easterbrook & Daniel R. Fischel, Limited Liability and the Corporation, 52 U. Chi. L. Rev. 89 (1985). An early perception of the effect of limited liability in tort contexts is found in Guido Calabresi, The Costs of Accidents (1970).

to a firm's actions do not materialize for several years: in such "delayed risk" contexts, limited liability actually can create a pathological incentive for entrepreneurs to operate firms without full insurance and thereby to externalize risk. Toxic substances represent the most significant case of delayed harm. Consequently, limited liability seems pernicious primarily in toxic substance markets.

b) Successor Liability. When successor liability obtains, a buyer of a firm's assets is liable for the seller's products liability torts.[34] The doctrine is useful because tort victims have difficulty suing the owners of dissolved corporations. Were a seller of corporate assets to remain in existence after the sale, suit would be easy; the seller would only have rearranged its assets, from old machines to cash or what the cash bought, and the victims could reach either. But if the seller dissolved, tort victims would have to locate and satisfy judgments against its former owners. The longer is the period between dissolution and the materialization of accidents, the more difficult is this task. Also, many states severely restrict or prohibit suits against former owners on claims arising after dissolution.[35] The difficulties involved in suing former owners create an incentive for the owners to *begin* firms that externalize risk. The successor liability doctrine compensates for this perverse incentive.

To perceive its function most clearly, recall that entrepreneurs are likely to operate without insurance if they can earn enough in the accident-free years to recover the wealth they contributed to the firm and earn a profit. It is necessary, we said, to recover the value of the wealth originally contributed because when accidents occur this wealth is lost to victims. The difficulties involved in suing former owners falsify this statement. An entrepreneur who can operate until the first victims appear, sell the firm's assets, and vanish with the cash does not lose the wealth he contributed to the firm plus goodwill; rather, he loses the *difference* between these things and the receipts from the asset sale. The smaller is this expected difference ex ante, the less wealth the entrepreneur expects to

[34] In a formal merger, the surviving entity is liable for all debts, including tort debts, of the predecessor corporations. When a company purchases another company's assets, the buyer is not ordinarily liable for the seller's debts. The successor liability doctrine deals with when the buyer is liable for the seller's torts. The literature and cases concerning successor liability are extensively summarized in Mark J. Roe, Mergers, Acquisitions, and Tort: A Comment on the Problem of Successor Corporation Liability, 70 Va. L. Rev. 1559 (1984); Jerry J. Phillips, Product Line Continuity and Successor Corporation Liability, 58 N.Y.U. L. Rev. 906 (1983). See also, Frederick K. Juenger & Stephen H. Schulman, Asset Sales and Products Liability, 22 Wayne L. Rev. 39 (1975).

[35] See Harry G. Henn & John R. Alexander, Effect of Corporate Dissolution on Products Liability Claims, 56 Cornell L. Rev. 865 (1971).

lose to victims. And the less wealth lost, the more likely will the firm be to operate uninsured.

Successor liability dampens the perverse incentive that the dissolution option creates. It does this by increasing the wealth that an entrepreneur will lose to victims, for its existence *increases* the difference between initial monies expended to start a firm and monies later received on the sale of assets. This difference widens because a successor that is liable for its predecessor's torts will pay less for its predecessor's assets, since they now come with accrued liabilities that it must bear *immediately,* the prior years of risk-free return having been enjoyed by the seller. Since buyers know of this risk, they will be unwilling to purchase the assets if their firm's net worth would be negative when the risk is considered; and if it is positive, they will treat the future liabilities as a lien on the present assets and pay accordingly, no matter whether they wish to stay in the old line of business or go into a new one. Imposing successor liability, moreover, should not disrupt the orderly operation of capital markets because the successor is in a good position to learn both the rate at which accidents happen and its predecessor's sales history, and thus be able to calculate the relevant exposures. As the present firm knows that it will not be able to escape liabilities by sale, it will therefore have an incentive to preserve its own marketability by taking out insurance in the first instance. It is better for the risk to be borne by successors who can protect themselves by contract than by tort victims who cannot.

Successor liability unfortunately is less effective in practice than this analysis suggests. Some states do not impose it even when the successor uses the assets to make the same product as the original company; most states do not impose it if assets are sold for cash rather than stock; and no states impose it if the successor uses the assets to produce a different product from the one produced by the original company.[36]

c) Bankruptcy. An entrepreneur would operate a negative-value firm even were limited liability abolished and successor liability complete, if he could function until accident costs began to accrue and then have all such costs—the entire delayed risk—discharged. Current law precludes this strategy; the weight of authority holds that tort claims based on harms that have yet to materialize cannot be asserted in bankruptcy.[37]

d) Legal Implications. Changes in corporate law would prevent entrepreneurs from operating firms that fail to insure fully against knowable tort risks. One change is to abolish limited liability if, when a firm's

[36] See authorities cited in note 34 *supra.*

[37] See authorities cited in note 1 *supra.* A recent opinion by Judge Posner suggests that courts may reconsider this rule. See In re UNR Industries, Inc., 725 F.2d 1111 (7th Cir. 1984).

assets, including insurance assets, are insufficient to satisfy tort claims, (i) the firm knew or should have known that it faced a positive probability of incurring a tort liability that would exceed its wealth, and (ii) if potential victims bargain with it, they are uninformed. The second condition actually is unnecessary, for the burden of the reform suggested here is to abolish limited liability whenever the tort system justifiably would hold the firm liable; and its rationale is that, as regards knowable risks, a firm's assets will be insufficient to meet tort claims only because its owners deliberately chose to operate in that way—to earn profits by externalizing risks. Also, the phrase "abolish limited liability" is used here as a shorthand for the congeries of civil remedies that the recent literature advocates to impose tort or environmental risks on firms *effectively,* such as holding the officers liable[38] or holding the owners in proportion to their capital contribution.[39] This paper's concern is not so much with how best to relax traditional corporate protections but with when they should be relaxed.

Here is an example of what I have in mind: the Johns-Manville Company once considered putting its asbestos-related activities into a separately incorporated division. Such a stratagem should fail for harms traceable to sales made after the asbestos risk became knowable. Had Johns-Manville pursued it, it should have been made to satisfy all liability judgments for such sales that its subsidiary could not satisfy. Otherwise, such use of a subsidiary, or of "unrelated" divisions of a conglomerate, would wrongfully permit a company to externalize risk to victims.

Successor liability also should be made complete for knowable risks. Successors should be liable whether they use the assets in the same line of business as the predecessor or in a different line.[40]

If limited liability is abolished, successor liability is complete, and contingent tort claims cannot be discharged in bankruptcy,[41] a firm could not shift delayed, knowable risks to victims. Corporate and bankruptcy law

[38] See Renier Kraakman, Corporate Liability Strategies and the Costs of Legal Controls, 93 Yale L. J. 857, 868–76 (1984).

[39] See Christopher D. Stone, The Place of Enterprise Liability in the Control of Corporate Conduct, 90 Yale L. J. 1, 69–79 (1980).

[40] This reform would free courts from the difficulty of deciding whether lines of business are sufficiently similar to hold the successor liable. For an effort to make such decisions, see Phillips, *supra* note 34.

[41] Roe recently argued that contingent tort claims should be assertable in bankruptcy to prevent firms from engaging in certain forms of inefficient behavior. See Roe, *supra* note 3. This proposal is not objectionable as regards knowable risks if these contingent claims are not dischargeable in full—if, that is, the firm is made to satisfy them to the full extent of its assets; Roe also advocates this. But Roe's proposal is unlikely to achieve its goals in practice, whether it applies to risks that are knowable or remote. See text at notes 50–54, *infra*.

thus would function to advance the goals that products liability law should serve.[42]

B. Remote Risks

To describe a risk as remote is not to say that a firm had no idea at all that its product could cause great harm. A risk is remote when a firm either (i) was this ignorant or (ii) believed great harm to be unlikely, *and* research to correct either impression was not cost justified. The standard products liability insurance policy covers all legal liability of a firm for risks within the designated class and so would protect a firm against remote risk impositions whose magnitudes were within the policy limits. When either of the two ways exists in which a remote risk manifests itself, however, those policy limits are likely to be too low. To see how this could occur, first let a firm plausibly believe that the product will not cause high accident costs at all. For example, the firm expects accident costs to range between $10,000 and $100,000. The firm then will not purchase more than $100,000 of insurance. If accident costs turn out to be $1,000,000, the firm is underinsured. Second, the firm can conceive of accident costs as high as $1,000,000 but plausibly believes that these large losses are unlikely. In this event, the firm also will be underinsured, though for a different reason: market insurance is overpriced. Insurance companies seldom have actuarial experience of new products or do their own research. One possible strategy for such a company would then be to accept our illustrative firm's estimate of the odds; in consequence, it would sell the firm $1,000,000 of coverage at a low rate. This strategy could create a serious adverse selection problem: firms with risky new products would portray themselves to insurance companies as selling safe

[42] The knowable delayed risk problem may be less serious than the text supposes because its emergence in a full equilibrium framework seems improbable. The analytical focus in such a framework is the market rather than the single firm. The text supposes a single firm that would operate for several periods, earn income, and then vanish. If the firm were not a monopolist, however, its rivals also would operate for several periods and vanish. The market for the relevant product then seemingly would have a set of firms enter, operate, disappear, and be replaced by a new set of firms. Alternatively, entry could take place at different times; then firms would continuously be entering to earn profits in the accident-free years and exiting when those years were up. Markets like this apparently have not been observed, and the latter form of behavior may not be an equilibrium since the frequent exits of harm-causing firms might alert workers and consumers to the product's actual riskiness. Thus, looking at markets rather than individual firms suggests that corporate structure may not be manipulated to externalize knowable delayed risks at all. This conclusion must be very tentatively held, however, because equilibrium results are risky to derive without doing the formal work. Hence the text argues that the law faces problems that are relatively easy to resolve even if firms would attempt to externalize knowable delayed risks.

new products; the companies, lacking research facilities, might be fooled. Insurance companies, however, are aware of adverse selection problems and so would pursue a different strategy: to charge relatively high rates until they had a contrary accident experience. A firm that believed its product was quite unlikely to cause serious accidents then would have a strong incentive not to buy market insurance; rather, it would self-insure for large, low probability harms—the $1,000,000 above—until it had enough experience to convince an insurance company that its odds estimate was correct.[43] But for remote risks, its estimate is false. For example, the firm may believe that the $1,000,000 liability would be incurred with probability .0001 and set aside $100 as a loss reserve, when that probability actually was .01, so that $10,000 should have been set aside. Again, the firm is underinsured.

Section II*B* next shows that firms cannot be given incentives to insure fully against remote risks. Also, when uninsured products liability costs, alone or when added to a firm's other debts, create a total liability that exceeds the firm's wealth, the firm will adopt resource-wasting strategies to avoid paying compensation.

1. Corporate Law

Section II*A* argued that limited liability should be abolished and successor liability made complete for knowable risks because then firms would have a greater incentive to act efficiently. Efficiency meant purchasing full insurance. A firm that is induced to insure, however, will buy coverage against the largest expected liability *that it anticipates*. But to say that a risk is remote is to say that the firm had false expectations about the frequency or the severity of claims. Though the incentive of such a firm to insure could be increased by abolishing limited liability and extending successor liability, the firm could not be made to insure correctly.

In addition, to adopt these reforms when risks are remote would have substantial efficiency costs. Respecting the abolition of limited liability, entrepreneurs deciding to start firms would have an incentive to conceal their wealth from potential victims, for otherwise they could unexpectedly lose all. The costs of concealing wealth are a deadweight loss. Also, potential investors in firms would have an incentive to monitor the wealth of other potential investors, to ensure that these shareholders were suffi-

[43] There is evidence that insurance companies are both raising rates and limiting coverage for toxic substances and that firms are self-insuring. See Liability Insurers are Fleeing Field in Wake of Big Damage Awards, Los Angeles Times, June 17, 1985, §4, at 1, col 5; Insurers Are Shunning Coverage of Chemical and Other Pollution, Wall St. J., March 19, 1985, at 1, col. 6.

ciently rich so that no one shareholder would bear a disproportionate share of liability costs.[44] This monitoring too is a deadweight loss. Finally, investment in firms that produce toxic substances will itself be reduced:[45] it would become more risky to contribute equity to such a firm, since the investor's personal wealth could be unpredictably destroyed. Because toxic substances such as drugs produce social benefits, decreased production of them would create welfare losses. Expanding successor liability for remote risks would create uncertainty in the market for used corporate assets, which could significantly reduce sales. Possible buyers would be deterred because purchase would subject their companies to literally unpredictable, possibly large claims.

To be sure, if the victims of remote risks are limited to a firm's assets, they will often be undercompensated, for the firm is underinsured. Hence, should the case for imposing remote risks rest largely on the necessity of *compensating* victims, that case is seriously compromised if limited liability and successor liability are retained in their current form. To decide what should ultimately be done, then, requires an analysis of the moral case for compensation, which is made below. The argument above shows only that pursuing this case through the vehicle of corporate law reform is likely to generate substantial inefficiencies.

2. Insolvency and Inefficiency

A firm may have negative value because it is made to bear delayed, remote risks. If so, it is insolvent in the balance sheet sense; its liabilities, including tort liabilities, exceed its assets. But the firm is not necessarily insolvent in the equity sense because it may be able to pay its debts as they mature, at least for a time. When equity insolvency has not arrived, a firm has a choice whether to dissolve or continue. This choice permits it to pursue either of two inefficient strategies, to liquidate when the firm's going concern value exceeds its liquidation value or to do negative net present value projects with high early payouts. These strategies sometimes permit firms to create gains for current claimants—the debt and equity—at the expense of future claimants—the victims of remote risks. Under current law, the future claimants can block neither strategy because they have no say in a firm's operation. Subsection 2*a* illustrates

[44] A more extensive treatment of the incentive of shareholders to monitor other shareholders is found in Halpern, Trebilcock, & Turnbull, *supra* note 33.

[45] Posner argued that abolishing limited liability would dampen investment incentives generally. See Richard A. Posner, The Rights of Creditors of Affiliated Corporations, 43 U. Chi. L. Rev. 499 (1976). The text argues that this dampening incentive will be exacerbated if courts impose remote risks on shareholders.

when a firm may liquidate inefficiently; 2*b* illustrates the adoption of negative value projects.[46] Readers uninterested in the details may skip to 2*c* and 2*d*, which summarize the data, show that current corporate and bankruptcy law permit both strategies, and argue that the strategies are difficult to prevent under any conceivable set of reforms.

a) An Inefficient Liquidation. Consider a firm with the balance sheet shown in the table below. The firm may liquidate at once, after the first $50 of tort claims tell that it is balance sheet insolvent, or it may operate for one period. If it liquidates, it pays current general claimants $50, current tort claimants $50, its bank $327 dollars, and its shareholders $73, the amount left from the $500 liquidation value.

Assets	Liabilities
Cash = 0	Bank debt = $300 at 9 percent
Present value = $600, viewed as:	Period 1 liability = $ 27
PV = $600 + .5($300) + .5(−$300)	Period 2 liability = $327
= $600	Period 1 claims:
	a) General = $50
Liquidation value = $500	*b*) Tort = $50
	Period 2 claims expected:
	a) General = $ 50
	b) Tort = $400

The bank and shareholders could only do worse on continuance. The firm's $600 present value is conceptualized as a sure receipt of $600 in period 2 plus a .5 chance of earning or losing $300 from future operations; this treatment is adopted to show that future operations have risk. The certain value to the bank from continuance is $27, its first year interest. The bank's expected value from continuance is $226.50, calculated as

[46] The existence of a bankruptcy option itself is an incentive for insolvent firms to pursue inefficient strategies such as those the text next describes. The behavior of such firms is modeled in Michelle White, Public Policy toward Bankruptcy: Me-First and Other Priority Rules, 11 Bell J. Econ. 550 (1980); Jeremy L. Bulow & John B. Shoven, The Bankruptcy Decision, 9 Bell J. Econ. 437 (1978). Imposing remote risks is objectionable because it increases the set of insolvent firms and strengthens their incentive to act inefficiently. This latter effect occurs because firms need not deal with future tort claimants, while the firms that White and Bulow and Shoven model had to deal with all claimants on their wealth. Thus everyone in their models who had an incentive to prevent or reduce inefficient behavior actually bargained with the firm. Respecting data about the relation between imposing remote risks on firms and insolvency, the text suggested above that the asbestos companies may not have foreseen the full extent of the asbestos risk. MacAvoy recently stated that the asbestos companies and their insurers would go bankrupt if they had to pay future claims at the rate the courts were making them pay current claims. See Paul MacAvoy, The Economic Consequences of Asbestos Related Disease 85–86 (January 1982) (Research Program in Government Business Relations, Yale School of Organization and Management, ser. C, Working Paper No. 27).

follows: The firm has a .5 chance of having only $300 of wealth in period 2 ($600–$300). In this event, $300 will remain to pay claims. As the bank is then owed $327 there will be $777 of claims, the bank would receive 42 percent of $300 or $126. Hence, the bank has a chance of getting $126, which is worth $63 ex ante. Were the firm instead to be worth $900 in period 2, the bank would be paid in full; a .5 chance of receiving $327 is valued at $163.50 ex ante. The sum of these alternatives is $226.50. The total value to the bank from continuance is the expected value of $226.50 plus the sure $27, or $253.50. This is less than the $327 the bank would receive on liquidation, so it would refuse to make further loans and urge the firm to dissolve.

The equity holders would agree. Were the firm to continue, there is a .5 chance it would have only $300 of wealth in period 2; then its debts would exceed its assets and its equity would be worthless. Were the firm instead to have $900, its assets would exceed its liabilities by $123 ($900–$777); a .5 chance of receiving $123 in period 2 is worth $61.50. Hence, the expected value to the equity from continuance is .5(0) + .5($123) = $61.50. Since the shareholders receive $73 on liquidation, they too will want to dissolve. Enough funds are available on liquidation to pay the other current claimants, and the future claimants have no say. Consequently, the firm will vanish.

Liquidation is inefficient because the firm's going concern value exceeds its liquidation value by $100. Also, since courts impose remote risks largely to compensate victims, and since future claimants will receive nothing, liquidation has moral costs. Here too the future claims actually had value. If the firm continued and was worth only $300 in period 2, the future claimants would be entitled to 51.5 percent; if the firm instead was worth $900, the future claimants would be paid in full. As there is a .5 chance of either outcome, the expected value of continuance to them is $277.25. Liquidation dissipates some of this value and transfers the rest to current claimants. In theory, the future claimants could bribe the debt and equity to continue; the former would be made better off by a payment of at least $73.51 and the latter by a payment of at least $11.51. The future claimants could make both payments and still hold claims whose expected net value is $192.23. Subsection 2*d* will show, however, that coalition costs and free-rider problems would prevent the future claimants from bribing the firm to continue.

b) Adopting Negative-Value Projects. The liquidation illustration was more favorable to tort claimants than real life sometimes is because it assumed that firms would take no steps to *reduce* their liquidation value or to *increase* the total claims on it. This assumption may sometimes be false when an entrepreneur discovers that he has inadvertently been oper-

ating a negative-value firm. Consider a project that will generate $200 in net revenue per year for two years but require a $500 payout in the third year. If the firm's cost of capital is 10 percent, the project's net present value is a minus $28.83. The entrepreneur nevertheless might cause the firm to do the project if major tort claims would mature in the third year; he would pocket $400 and then liquidate the firm. The future claimants would have to share the liquidation value with the $500 claimant. Alternatively, a firm may harvest natural resources earlier than it should. For example, let a firm own a mine that will produce $5,000 of coal if it is mined today; the firm expects coal prices to rise in response to rising oil prices but then level off. Its discount rate is 10 percent, and it believes that the coal will yield $7,000 if mined in a year, $8,500 if mined in two years, $9,500 if mined in three years, and $10,000 if mined in four years. The firm should mine the coal in the third year because the present discounted value of that yield is $7,142.86, which is greater than the present discounted value of any other yield. But if major tort claims will accrue in the third year, the firm will mine in the second, which does not maximize value.[47]

Such inefficient projects sometimes are available. One example is borrowing, which brings in money at once and requires later payouts. Lenders, however, may also discover that the firm is insolvent. A more real-

[47] Respecting the text's two illustrations, for the first: net present value = $200/(1.1) + 200/(1.1)^2 - 500/(1.1)^3 = -\$28.83$. For the second:

Time	Value of Yield ($)	NPV at $r = .10$ ($)
0	5,000	5,000
1	7,000	$7,000/1.1 = \$6,363.64$
2	8,500	$8,500/(1.1)^2 = \$7,024.79$
3	9,500	$9,500/(1.1)^3 = \$7,142.86$
4	10,000	$10,000/(1.1)^4 = \$6,849.32$

This illustration is too simple because it lets the firm treat future prices as certain and does not let the discount rate vary with the firm's choice of technology and extraction rate. In reality, natural resource prices vary widely and the firm's discount rate is partly endogenous. Adding these factors does not change the basic point, which is that an insolvent firm has an incentive to accelerate the extraction rate inefficiently. See M. J. Brennan & E. S. Schwartz, Evaluating Natural Resource Investments (working paper, Univ. British Columbia 1983). The firm, in theory, might sell the right to mine coal in the third year for $7,142.86, thereby maximizing the value of the resource. Information asymmetries may impede such sales; while coal is homogeneous, the firm best knows its production function and therefore best knows the net yield. Also, outsiders may discount the price substantially because of uncertainty respecting future prices. Finally, if successor liability applied to remote risks, there might be no one willing to purchase the assets.

istic example would be for a firm to engage in a natural resource business that has a reclamation obligation that the firm plans not to meet. For instance, a firm might strip mine coal for a time, planning not to reconstruct the land. More simply, a firm, when calculating a project's value, should include the cost of replacing necessary machines. A negative-value project can thus become positive if no replacement cost is assumed. Firms that plan to dissolve will not assume replacements. Thus they may exhaust present or new assets, vanishing when these are gone.

c) Data. Current claimants on a firm that learns ex post that it has negative value have incentives either to liquidate the firm though its going concern value exceeds its liquidation value or to have it pursue inefficient projects with high early payouts. Until recently, few firms have been in this situation, and these seem not to have been systematically studied. The anecdotal evidence, though, is consistent with the story. A group of current claimants against Johns-Manville have asked the bankruptcy court to liquidate the company, though management claims that its going concern value exceeds its liquidation value; rather, management's hope seemingly is to have the bankruptcy court eliminate or substantially reduce the future claims.[48] The court's apparent lack of sympathy with this hope appears to underlie the frequent claims that the company is stalling—refusing to propose a reorganization plan while continuing to use the protection of the bankruptcy court. With respect to possible motives for a stall, Johns-Manville has been accused of paying unusually high dividends, which redistribute wealth in favor of current claims and against future ones. Also, it allegedly is overcutting timber, perhaps because it has no intention to replant, in which case it may be pursuing a negative value project with a high current payout, because it is harvesting too early, which also is inefficient.[49] The plausibility of the story told above together with evidence of this sort suggest at least the provisional accuracy of a prediction that ex post negative-value firms will be run inefficiently.

[48] See Manville Corp. Faces Increasing Opposition to Bankruptcy Filing, Wall St. J. January 31, 1984, at 1, col. 5.

[49] Johns-Manville's behavior is described in Roe, *supra* note 3. The deadweight losses that occur in insolvency contexts when some claimants on a firm redistribute wealth in their favor from other claimants may be mitigated when claims can be freely purchased and recombined, for then it would reward an economic agent to purchase *all* of the claims on a firm and make economically efficient decisions on its behalf. There is weak evidence that this sometimes happens. See Carliss Y. Baldwin & Scott P. Mason, The Resolution of Claims in Financial Distress: The Case of Massey Ferguson, 38 J. Finance 505 (1983). The lack of a market for future tort claims and the obvious difficulties in creating one imply that the deadweight losses the text describes will not be mitigated by such recontracting.

d) Legal Remedies. Current law cannot prevent inefficient liquidations when firms can pay off existing claimants. Today, a firm can liquidate privately or in bankruptcy. The latter route is open because future claimants now lack standing in bankruptcy proceedings and so could not intervene to ask bankruptcy judges to require reorganization—continuance—rather than to permit liquidation. The future claimants could be given standing in bankruptcy but, as Roe recognized, no way now exists to get equity-solvent firms into bankruptcy if they do not want to go there.[50] If such firms could do better by liquidating privately than by being forced to continue, they would pay off current debt and vanish.

Future claimants could be authorized to trigger bankruptcy proceedings rather than wait for them. Too few claimants would take up the chance, however, to make this reform helpful. The set of future claimants is composed of persons who have been exposed to toxic substances. These persons would often regard the certain costs of a lawsuit to force a bankruptcy as higher than the uncertain gains. These gains are uncertain for three reasons. First, persons exposed to toxic substances suffer harm with a probability that is less than one and difficult to calculate precisely. Also, the harm will occur an undetermined time in the future. The gain to a future claimant from bringing a suit cannot exceed the expected value of his injury; when the probability and timing of injury are both uncertain so also is this expected value. Second, the expected value of the injury is higher than the expected gain that would be realized in bankruptcy. The value of a bankruptcy claim is partly a function of how many such claims there are. When a firm has $1 million in assets and $2 million in claims, each claim is worth 17 percent more than if the asset value were unchanged but there were $3 million in claims. A future claimant would seldom know how many other such claims there were; hence, he would have difficulty valuing his claim in a bankruptcy, even if he could calculate its expected value independent of bankruptcy.[51] Finally, a future claimant who is a consumer or worker could not easily know whether the firm could pay *his* claim, which might be small or arise early, though the

[50] See Roe, *supra* note 3.

[51] Valuing claims on firms is always complicated by the possibility of bankruptcy; should bankruptcy occur, the value of a claim reduces to its value in bankruptcy, but this is hard to calculate ex ante because it is hard to predict what a firm's asset-to-debt ratio will be when it becomes insolvent. See Alan Schwartz, Security Interests and Bankruptcy Priorities: A Review of Current Theories, 10 J. Legal Stud. 1, 24 (1981). This uncertainty shrinks substantially for current claims when bankruptcy actually occurs; then debts and assets are at least roughly knowable. But uncertainty as to claim value may never shrink much for current and future claimants if future claims are provable in bankruptcy, because it is very difficult to ascertain the number and value of claims that have not arisen.

firm could not pay all. To force a bankruptcy, a future claimant would have to incur certain expenses. That is, he would have to pay lawyers to bring a lawsuit that the firm would strongly contest. The very uncertain value of the gains from such a suit often may seem lower than these expenses.[52]

In addition, to force a bankruptcy is to provide a public good. Once a bankruptcy has been triggered, no future claimant could be excluded from it, whether he contributed to the triggering law suit or not. When the costs of a bankruptcy suit exceed the expected gain to any individual claimant from bankruptcy, no bankruptcy would occur, even if future claimants could value their claims accurately. Rather, a suit would be brought only if a claimant coalition could be formed. The large number of future claimants, the difficulty of identifying them and of communication among them, and the incentive of each to let others finance the law suit make formation of an effective coalition unlikely.[53] And without such a coalition, future claimants also would not bribe firms to continue, though their going concern value exceeded their liquidation value.

For all of these reasons, few future claimants would attempt to force bankruptcies or otherwise prevent firms from dissolving. And those that made determined efforts could be bought off. Hence, allowing future claimants to trigger bankruptcies would seldom prevent inefficient liquidations.

Allowing a public agency to force bankruptcies may have a better chance of success, but not much better because the agency often would not know when to act. Future claimants would have to come forward to notify the agency; doing this raises many of the problems just discussed, for the future claimant actually is a person, who may be reluctant to become involved in an administrative proceeding when he is now healthy and may never suffer. The experience of the Federal Trade Commission and the Justice Department in attempting to prevent rather than undo

[52] The contingent fee allows persons to transfer some of the litigation risk to lawyers for a fee, but the litigation risk for future claims seems so high that lawyers would be unlikely to invest substantial resources in such suits.

[53] Class actions can function to mitigate the public-good aspects of litigation, but the diversities among current asbestos claimants, for example, have so far prevented classes being certified for them. The difficulty remains, a fortiori, for future claims. The plaintiffs' tort bar conceivably could have sufficiently low coalition costs and sufficiently homogeneous interests to mitigate some of the difficulties the text discusses. This seems a remote possibility, however. The issue here is not whether the state should permit future claimants to trigger bankruptcies, an issue on which the tort bar perhaps could lobby, but whether the future claimants of a particular firm will trigger its bankruptcy. This requires a coalition to form around a single lawsuit, not a general issue; for the reasons given above, such coalitions will be unlikely to form.

noncompetitive mergers also suggests that a public agency cannot be effective unless firms are required to report extensively to the government about proposed and present business activities. The market anticipates many of these activities, yet the firms that they would adversely affect seemingly lack a sufficient voluntary incentive to notify the relevant government agencies. Also, the sanctions for failing to report are imposed on the offending firms. When firms are vanishing rather than continuing, sanctions for failing to report to a Federal agency their plans to vanish would be difficult to apply. Thus, a federal agency too would seldom prevent inefficient liquidations.[54]

e) Concluding Remarks. Imposing remote risks on firms generates particular efficiency costs, but these costs are not entirely absent when courts impose only knowable risks. A firm may fail to do the optimal amount of research; if so, it may warn inadequately and underinsure. When the knowable risk materializes, this firm too will face large uninsured liabilities that create incentives to liquidate inappropriately or waste wealth. However, the sanctions that now follow from knowable risk impositions, together with those that would follow from adoption of the reforms Section II*A* suggests, would ensure that there would be few such firms. In contrast, the particular efficiency costs that Section II*B* describe are the *inevitable* accompaniment of remote risk impositions, for firms seldom could insure fully against remote risks and so would have incentives to act inappropriately whenever these risks materialize.

Courts conceivably could err by characterizing a risk as knowable that actually is remote; if so the difficulties just noted may apply widely, especially if the reforms urged in Section II*A* are adopted. The possibility of error does not imply different conclusions from those reached above. As Section I*C* showed, the response of firms to adjudicatory uncertainty is to do more research than may be optimal. The effect of this research will often be to produce court or jury findings favorable to defendants or lead to the discovery of more risks; either outcome reduces the likelihood that judicial error will disadvantage firms in the ways that Section II*B*

[54] Roe, *supra* note 3, argues that both future claimants and a public agency should be authorized to trigger bankruptcies but, in my view, does not give adequate weight to the difficulties raised here. Roe, however, recognizes other difficulties with his proposals. He argues for them not because he believes that they are perfect but because his paper assumes that future claims must be satisfied; given this assumption, he must find some way to satisfy them. The difficulties with his proposals, and the extraordinary complexity of the compensation schemes he and others are driven to propose, suggest rather that the question whether to pay future claims should be regarded as open. This paper begins with that view, and Section III argues that when the future claims arise from remote risks, they should not be imposed on firms at all. If this view is accepted, whether and how these future claims can be asserted in bankruptcy are no longer questions.

describes. Also, these disadvantages could be avoided completely only if courts imposed no risks on firms, which plainly would be unwise. This paper's compromise—to impose only knowable risks but to make those risk impositions effective—is itself risky but pursues all of the relevant policy goals more effectively than any competing rule.

III. The Case for Not Imposing Remote Risks

The case against judicial imposition of remote risks on firms follows from the premise that misfortunes that "life" visits on people should not be shifted directly to other people (or to firms) unless "good reasons" exist to shift them. Life obviously is partly constituted by human actions. And the good reasons can be consequential (shifting losses is efficient) or deontological (a particular set of unfortunates has a right to have others bear losses that first fall on them). The collectivity of course may have duties of justice or benevolence to unfortunates, but private citizens, it is assumed, cannot be made to bear the full burden, unless good reasons exist. One justification for this premise is that shifting losses is costly. Costs should not be incurred without good cause. A second justification follows from our society's respect for and protection of individual autonomy. Such a commitment to individualism implies that a person's misfortune is his or her own affair, unless good reasons exist to make it another's affair.

Section III supposes these justifications to persuade and argues that acceptance of the basic premise implies the correctness of a rule holding firms liable only for knowable risks. The argument to here partly establishes this claim. Section I showed that, as regards such unavoidably dangerous products as toxic substances, remote risk impositions would actually cause firms to discover fewer dangers than would knowable risk impositions. Section II then showed that remote risk impositions generate substantial costs because firms have incentives to engage in resource-wasting strategies when large, unanticipated liabilities materialize. Therefore, not only do efficiency reasons fail to support shifting the costs of remote risks from victims to firms, but these reasons affirmatively imply that firms are the wrong risk bearers.[55] Section III next argues that justice reasons also cannot support imposing remote risks on firms.

[55] In addition to these efficiency concerns, remote risk impositions sometimes may pointlessly drive firms out of business. This could occur when a remote risk materializes such that victims' costs exceeded the value of firms in a market, but the product is viable with warnings. Viability is possible if peculiarly sensitive persons could avoid exposure and others could take appropriate precautions. For example, persons who smoke are approximately sixty times more likely than nonsmokers to become ill from asbestos exposure.

A tort plaintiff may rest a claim for relief on any of three aspects of justice: retributive justice, which would support imposing liability to punish the defendant's morally culpable behavior; distributive justice, which would support imposing liability to produce a fairer distribution of wealth; and corrective or compensatory justice, which would support imposing liability to rectify a loss that the defendant wrongfully caused. A justice-as-retribution case seems groundless because a plaintiff would be suing in strict liability, which does not require a finding of fault, let alone immoral fault, to sustain an imposition of liability.[56] The victim of a remote risk also lacks tenable distributional and compensatory justice claims.

A. Distributional Justice

1. Loss Spreading

The loss-spreading justification for strict liability cannot support remote risk impositions because firms will not spread the losses associated with remote risks. Firms spread losses by insuring against them and reflecting premium costs in their prices. Because firms are ignorant of remote risks, they do not insure them fully. Consequently, when these risks materialize a court's choices are limited to letting the resultant costs lie or ordering direct wealth transfers from a firm's shareholders to plaintiffs. Neither outcome produces loss spreading.

Courts sometimes suggest that firms will reflect the cost of judgments for remote risks in future prices.[57] Were this true, at least part of the normative case for loss spreading would have to change, for those who benefited from the product that caused harm, the past users, would pay nothing, while those who did not benefit, the future users, would be largely responsible. But in fact the cost of past judgments will not be reflected in future prices at all. A cost change will not affect price unless it causes a firm's marginal cost curve to shift. When a firm discovers that it must make a set of liability payments to remote risk victims, it incurs an immediate cost, the present discounted value of the payment stream. This

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Hence, nonsmoking asbestos workers, particularly if they use respirators, may be bearing acceptable risks. If so, asbestos could be viable with warnings. Then such products should continue to be produced with warnings, but the firms originally in the market may dissolve as a result of insolvency. Other firms will then enter, but these entry costs are a waste, for the original firms could have continued to produce had they been made only to warn after the risk became knowable.

[56] See Jules Coleman, Moral Theories of Torts: Their Scope and Limits (pt. 1), 1 Law & Phil. 371, 374–75 (1982). Section III*B* will argue that a firm's failure to discover a remote risk is in any event not morally culpable.

[57] For example, Beshada v. Johns-Manville Corp., 90 N.J. 191, 447 A.2d 439 (1982).

cost is unrelated to production and so will never shift the firm's marginal cost curve.[58] Hence, to impose on firms risks that they cannot profitably discover is, as was just said, to compel direct wealth transfers from shareholders to victims.[59]

2. Distributional Justice in General

Courts deciding products liability cases explicitly refuse to justify outcomes on distributional grounds.[60] Though this denial is sometimes insincere, it is always correct. To make out a distributional justice case, a claimant must show that an existing distribution of wealth should be altered in his favor. A refusal to impose remote risks on firms benefits shareholders at the expense of victims. Hence, a victim must claim that it is unjust to burden victims as a class rather than shareholders as a class or that it is unjust to burden him rather than the particular shareholders of the firm he sues. The former claim is weak because the classes victim and shareholder are too much alike. Many shareholders are not rich and many victims are not poor. Also, many shareholders are potential victims; a

[58] Henderson argued that firms will spread the losses from difficult-to-anticipate risks over products unrelated to those that caused injury, thereby misallocating resources. See James Henderson, Coping with the Time Dimension in Products Liability, 69 Calif. L. Rev. 919, 942–44 (1981). However, the liability for such losses will not be reflected in prices at all, as it does not affect variable or fixed costs. Gary Schwartz agrees that damages for unforeseen risks will not be spread, but seems to believe that this is so because firms in a competitive industry operate where price equals cost and so have no power to raise price. See Schwartz, *supra* note 5, at 825 n.180. Such firms, though, would raise prices if marginal costs rose; for remote risk impositions they will not.

[59] Page recently argued that firms should bear remote risks because the law should protect "justifiable consumer expectations," and consumers can justifiably expect always to buy safe products. Joseph A. Page, Generic Product Risks: The Case against Comment K and For Strict Tort Liability, 58 N.Y.U. L. Rev. 853, 889 (1983). Page begins with the standard manufacturing defect case, in which the firm knows the risk. If the firm markets a defective product without a warning, it makes "an implied representation of safety"; the effect of this representation is to "deprive the consumer of the opportunity to evaluate the risk and to decide whether to accept it." *Id.* at 889 (footnote omitted). The argument has two aspects: (*a*) the consumers' expectations derive from the "implied representation"; (*b*) these expectations are "justifiable" because the normative goal is to induce manufacturers to make safe products or supply consumers with information so the consumers can protect themselves. Page then argues that this analysis justifies manufacturer liability when a product poses "an unknown or unknowable generic hazard"; there too, "an implied representation of safety" is made. *Id.* The second aspect of Page's argument falls for such products, however. Imposing liability for remote risks neither increases safety nor warnings. Hence, even if consumers in fact always do expect products to be safe, they could not "justifiably" expect firms to assume remote risks. As Page himself recognizes, to make out a traditional expectations argument, one must first show "which consumer expectations are justifiable"; only then can one ask what actually was expected. *Id.* at 887.

[60] This is what courts mean by the frequent statements that manufacturers are not insurers and that tort liability is sometimes strict but never absolute.

substantial portion of firm wealth is held by employee pension funds and insurance companies. Further, many victims have at least partial insurance while shareholders, ex hypothesi, have none because the risks were remote. Finally, redistributing wealth to victims cannot be justified by the notion that, other things equal, money should be transferred from large groups to small ones, if the small ones need help. Often, as in the Johns-Manville case, the number of potential victims may approximate the number of shareholders. Therefore, a plaintiff's claim for relief based on his membership in the victim class does not implicate the justice of society's basic institutions in the way claims that wealth should be transferred from the more to the less well off do.

A victim must instead argue that it is unjust for *him* rather than the particular shareholders of the defendant firm to bear the costs of a remote risk. Distributional justice theories, however, do not support such fine-grained distinctions among persons. Rawls's theory, for example, claims only that society's "basic structure" should be just, that society should ensure an equal distribution of "primary" goods, and that any other distinctions in the basic structure should be to the advantage of the worst-off group.[61] The basic structure is composed of such principal institutions as "parliaments, markets and systems of property"; these derive from "a public system of rules."[62] If the basic structure is just, then individual distinctions are likely to be made correctly. Rawls thus explicitly states that it is a "mistake" for a theory of justice to consider the "relative positions of individuals. . . . If it is asked in the abstract whether one distribution of a given stock of things to definite individuals with known desires and preferences is better than another, then there is simply no answer to this question."[63] Hence, a victim cannot justify a transfer from a particular set of shareholders to himself on Rawlsian grounds.

Utilitarian distributional theories also cannot justify such a claim. This is not because interpersonal utility comparisons between shareholders and victims cannot be made rigorously; such comparisons may be made in an acceptably rough and ready way, if one has enough information about the parties' particular circumstances. But getting this information in the context of lawsuits as these now are run is difficult to do. And the effort would also permit courts and other strangers to investigate the personal lives of litigants more thoroughly than current conceptions of privacy permit. If one takes the sensible, and popular, view that a pursuit of

[61] See John Rawls, A Theory of Justice (1971).

[62] *Id.* at 55.

[63] *Id.* at 87–88. See also 304.

utilitarianism should be tempered by rights constraints, these privacy concerns imply that utilitarian distributional justice claims also are out of place when a particular individual claims money from another. Rather, utilitarianism seems better suited to evaluating society's basic redistributional decisions. To do this requires interpersonal utility comparisons between large, disparate groups, such as rich and poor, that can be drawn on the basis of what people in general are like, and without the particular personal information on which individualized interpersonal utility comparisons must rest.[64]

These distributional arguments may be objected to on the ground that shareholders do or could diversify away from the risk of a particular firm's bankruptcy and thus would not suffer when victims take the firm's assets. This objection is without merit. If the shareholder's loss exceeds de minimus, the premise that began Section III applies: victims' costs should not be shifted to others unless good reasons appear. The shareholders' loss from remote risk impositions would exceed de minimus because it is difficult fully to diversify away from the relevant risk and because the risk will not be fully impounded in the price of a firm's stock. Respecting the former point, a rule imposing remote risks, were it widely adopted, would affect a large number of firms, benefiting workers and consumers at the expense of shareholders and managers. Since shareholders cannot hold stock in workers and consumers, they could not diversify fully away from remote risk impositions. Even if they bore only the "market risk," the legal rule would increase the level of this risk. Respecting investment returns, the strong form of the efficient market hypothesis holds that market prices reflect "all the information that can be acquired by painstaking fundamental analysis of the company and economy."[65] An outsider's fundamental analysis of the company would not reveal the existence of remote risks that are unknown to the firm's managers unless the outsider was willing to do what the managers are not—to lose money at research. Because such outsiders are unlikely to exist, no one in a market will be able to value remote risks. Consequently, the price of shares in a firm such as Johns-Manville was overstated ex ante, in that it failed to reflect the risk actually associated with the firm's income stream. A person holding a portfolio that included Johns-Manville stock thus paid too much for that portfolio and will lose the difference between what he should have and did pay, compounded to reflect alterna-

[64] This argument derives from Brian Barry, Fair Division and Social Justice (unpublished manuscript, Cal. Inst. Tech. 1984).

[65] Richard Brealy & Stuart Myers, Principles of Corporate Finance 270 (2d ed. 1984).

tive investment opportunities. Given the radical dilution to which Johns-Manville stock will be subject, this loss is not trivial.[66] Therefore, shareholders can be expected to bear noticeable losses were remote risks to be imposed on firms; no distributional justice reasons support making shareholders worse off in this way.

B. Compensatory Justice

The compensatory justice approach to tort law is concerned to compensate only persons whose harms are *causally* linked to the *wrongful* conduct of others. Those injured in this way have a right to redress; the injurers have a duty to pay it.[67] A plaintiff must then prove, to establish a compensatory justice case for relief, that defendant caused his injury and did so wrongfully. Plaintiffs can establish a compensatory justice case for relief when risks are knowable, and can establish the necessary condition of causation when risks are remote.[68] Firms, however, do not act wrongfully toward victims in connection with remote risks because they are not morally responsible for failing to warn that these risks exist. Since the existence of wrongful conduct is a necessary condition for the establishment of a compensatory justice case, no remote risk plaintiff can make this case out.

[66] In the Johns-Manville bankruptcy, the firm's managers agreed to accept a 67 percent dilution in the value of the firm's stock but plaintiffs' lawyers are holding out for 80 percent. The stock fell from a 1981 high of 26 to a mid-1983 price of 9. See Barrons, July 23, 1984, at 6–7. The Manville shareholders strongly opposed the most recent plan, claiming that it would reduce by as much as 80 percent the value of their present holdings. See Holders Oppose Manville Reorganization Plan, Los Angeles Times, August 6, 1985, § IV, at 1, col. 1.

[67] Epstein seems first to have argued that tort law's function is to redress injuries that others cause. See Richard A. Epstein, A Theory of Strict Liability, 2 J. Legal Stud. 151 (1973); Richard A. Epstein, Defenses and Subsequent Pleas in a System of Strict Liability, 3 J. Legal Stud. 165 (1974); Richard A. Epstein, Intentional Harms, 4 J. Legal Stud. 391 (1975). The full argument is in Richard A. Epstein, A Theory of Strict Liability: Toward a Reformulation of Tort Law (1980). The standard critique is John Borgo, Causal Paridigms in Tort Law, 8 J. Legal Stud. 419 (1979), which agrees with Epstein that tort law must require the existence of a causal link between injurer and victim but argues that Epstein's causal notions are too primitive and his moral theory is insufficiently developed. The fullest current statement of the compensatory justice aspect of tort law is in a series of papers by Coleman. See Coleman, *supra* note 56; Jules Coleman, Moral Theories of Torts: Their Scope and Limits (pt. 2), 2 Law & Phil. 5 (1983); Jules Coleman, Mental Abnormality, Personal Responsibility and Tort Liability, in Mental Illness: Law and Public Policy 107 (B. A. Brody & H. Engelhardt, Jr., eds. 1980).

[68] An extensive analysis showing the causal link between a firm's conduct and a victim's injury, for both knowable and remote risk cases, is found in the working paper version of this article. Alan Schwartz, Products Liability, Corporate Structure and Bankruptcy (Cal. Inst. Tech. Social Science Working Paper No. 542, 1984) at 67–76. The working paper also shows that firms are responsible for the harms they cause when risks are knowable. *Id.*

It is unnecessary to develop a full theory of responsibility for the harms one causes to show that firms are not responsible for failing to warn. This is because any full theory would make the element of the manufacturer's *choice* an important feature; and this element has considerable explanatory power. Choice is relevant on the following argument: (*a*) to say that a person is responsible for the harms he causes is at least to say that he had a choice whether to cause the harms or not; (*b*) one has a choice only if one acts under conditions that insure intentionality; (*c*) the most important such condition for the present purpose is that the chooser was informed of the likely consequences of his acts; little or no moral weight attaches to choices made in ignorance;[69] (*d*) this condition is put too simply because one may choose to remain ignorant, yet persons cannot escape responsibility if they deliberately move forward while looking down; (*e*) thus a person's choice should be regarded as uninformed, from a moral point of view, if and only if the person is ignorant in fact of the likely consequences of his actions and his ignorance is justifiable.

Both requirements of condition *e* are met in remote risk cases. A risk is remote when the possible harm that a product could cause is too little and too unlikely to justify a research project to learn any more about what the harm actually is. Not to do additional research in this circumstance maximizes welfare. Also eschewing research is not disrespectful to potential victims in any neo-Kantian sense. Were research done, the victims would have to pay, yet they would not want to pay because, ex hypothesi, the research is not worth doing. To omit research that no one wants is to further rather than retard people's concerns. Hence, firms neither know nor should know about the existence of remote risks.

This analysis does not conflate an economic argument that firms are not responsible—research is not profit maximizing—with a moral argument. Economic and moral arguments are not necessarily coextensive, but it is difficult to see a noneconomic argument that would hold firms responsible for failing to discover and warn against remote risks. That this difficulty exists is unsurprising, as may be illustrated by considering a firm's actual choices. It can choose not to make a product though the product is useful,

[69] Alan Donagan states: "It is impermissible to blame anybody for an action except as falling under a description under which it is voluntary, that is, done knowingly. . . . That it [the action] falls under other descriptions is his good or bad fortune . . . an agent is not answerable for his good or bad fortune." Alan Donagan, The Theory of Morality 121, 126 (1977). Donagan derives this view from Judeo-Christian morality, and it is also Kant's position. Recently, some philosophers have attempted to work out a concept of "moral luck," in which an agent can assess the morality of his own actions in a nonutilitarian way by asking how those actions actually turned out. See B. Williams, Moral Luck 20–39 (1981); T. Nagel, Mortal Questions 24–38 (1979). These efforts seem to me to be incoherent and mistaken, and in any event their authors apparently do not regard them as especially helpful to people who want to assess actors other than themselves. See Williams, *supra*, at 36–37.

seems safe, and therefore has customers. It can warn that the product is dangerous though no persuasive grounds to believe this exist and the warning will reduce sales by frightening consumers without apparent cause. Or the firm can conduct a research program whose costs exceed its expected gains, and with no guidance as to how much money it is morally necessary for the firm to lose. In a world where firms are supposed to earn profits these are not real choices. Consequently, an independent moral ground for holding firms responsible here is unlikely to be found; a valid moral ground for imposing a duty seemingly must presuppose the existence of actors for whom compliance would not entail a contradiction. And so no compensatory justice case for imposing remote risks on firms exists.

C. The Humanitarian Claim

A humanitarian claim to relieve needless suffering always exists. Victims of remote risks needlessly suffer; they too could not have discovered the danger and it harmed them. Humanitarian claims, however, are seldom vindicated in lawsuits. There are too many of them and they make us all defendants. In a world of scarce resources, the questions they raise are how to rank the claimants, how much each of them should receive, and how much of the obligation to give must each of us satisfy. None of these questions is justiciable. Are asbestos victims more deserving of relief than sickle cell anemia victims or tornado victims? Should asbestos victims be given medical care only? Compensation for pain and suffering? Compensation for their dependents? If no one in particular is morally responsible for their plight but they have moral claims against us all, should courts allow victims to sue oil companies? Real estate tycoons? Union pension funds? If it would be supererogatory for each of these possible defendants to contribute their entire wealth to the relief of victims, how much should they be made to pay? No moral theories directly imply principled and relatively precise answers to these questions. Yet it is just such answers that this society wants courts to give. Hence, the humanitarian case for relieving the suffering of victims of remote risks cannot support imposing those risks on firms through the vehicle of products liability suits.

To acknowledge the existence of a humanitarian case, however, is to reintroduce efficiency concerns, for some forms of public funding conceivably could create resource misallocations that exceed those that would flow from judicial imposition of remote risks. Given the difficulty of quantifying either form of misallocation, general efficiency conclusions seem hard to draw. One may assume that society is otherwise well ordered, so that public funding is done in such a way as to have no efficiency costs; but this assumption is very strong. A more sensible way to proceed

is to recognize that the difficulty just noted is unlikely to be important in practice, for the probable response of Congress in tort risk contexts would be to adopt a workman's compensation solution, in which firms have clearly defined obligations to contribute to a fund (or purchase insurance), workers' damages are explicitly limited and specified and the federal remedy is made exclusive.[70] Such solutions in effect internalize risk costs and make them predictable and so should not cause serious misallocations.

IV. Conclusion

Courts should not impose remote risks on firms. A remote risk is a risk whose full extent a cost-justified research program would not reveal. To impose such risks is unfair, for it makes firms responsible for what they would not prevent. Also, firms have incentives to pursue inefficient strategies, such as liquidating when their going concern value exceeds their liquidation value, just to avoid the surprising liability that a remote risk imposition creates. The use of these strategies apparently underlies the extraordinary problems that bankruptcy and corporate law face in situations such as the asbestos disaster. These bodies of law can conveniently resolve the problems that products liability accidents create, when firms can anticipate the risk of those accidents. But corporate and bankruptcy law can never cope with the chaos that can result when firms are made to bear large liabilities for which they could not plan.

The fairness and efficiency objections to imposing remote risks on firms imply the error of such impositions unless strong instrumental or justice reasons exist to hold firms liable. But there are no such reasons. Imposing remote risks advances none of the instrumental goals that tort law pursues, nor is it implied by any justice-based tort theory. This is not to say that society owes no obligation to the victims of remote risks. Our country routinely honors the humanitarian claims of persons harmed by unexpected disasters. The private law suit, however, has traditionally been regarded as an impermissible method of meeting such obligations. That the victims of some remote risks can conveniently cast their claims in the form of private law suits is a contingent fact, not a justification for altering this practice.

[70] Most of the bills now before Congress to compensate asbestos victims are of this type. See, for example, H.R. 5735, 97th Cong., 2d Sess. (1982); H.R. 5224, 97th Cong., 1st Sess. (1981). One bill makes the victim's remedy nonexclusive and has no cap on damages, but it also exculpates firms if "the release [of the substance] was not the result of a failure of the defendant to exercise due care with respect to the hazardous substance concerned in light of all relevant facts and circumstances." H.R. 7300, 97th Cong., 2d Sess. (1982), 101(c)(2). This section invites, if it does not require, courts to impose only knowable risks on firms.